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# The Journal *of the* SOCIETY OF DYERS AND COLOURISTS

Volume 73 Number 5

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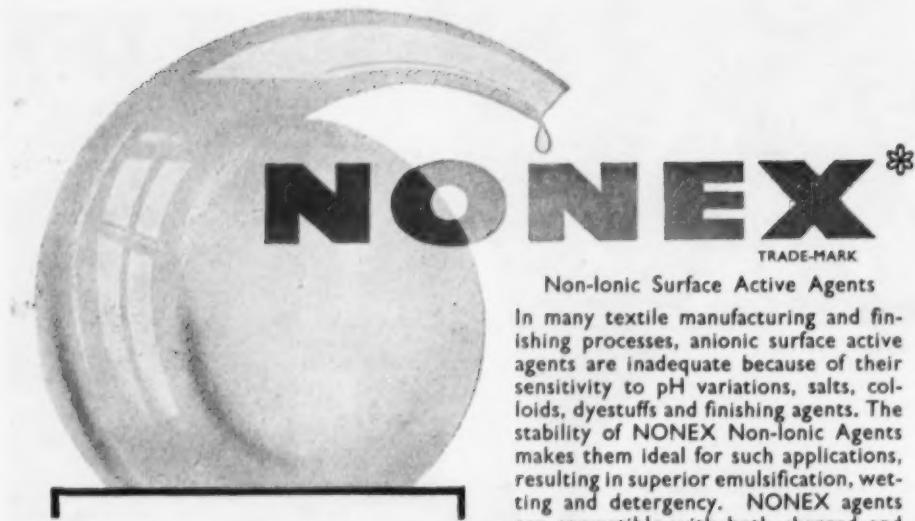
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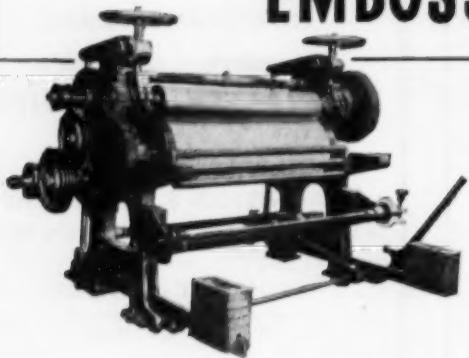
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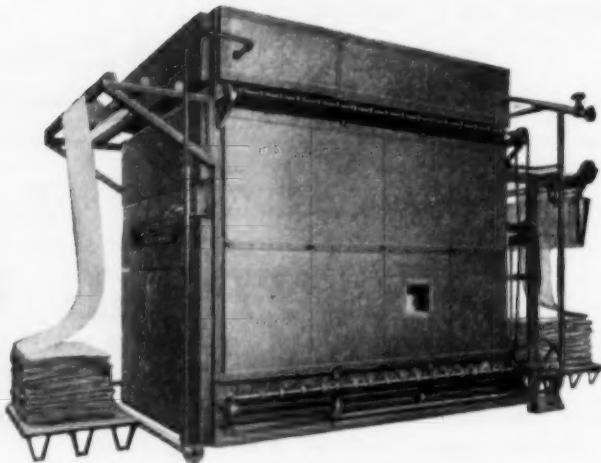
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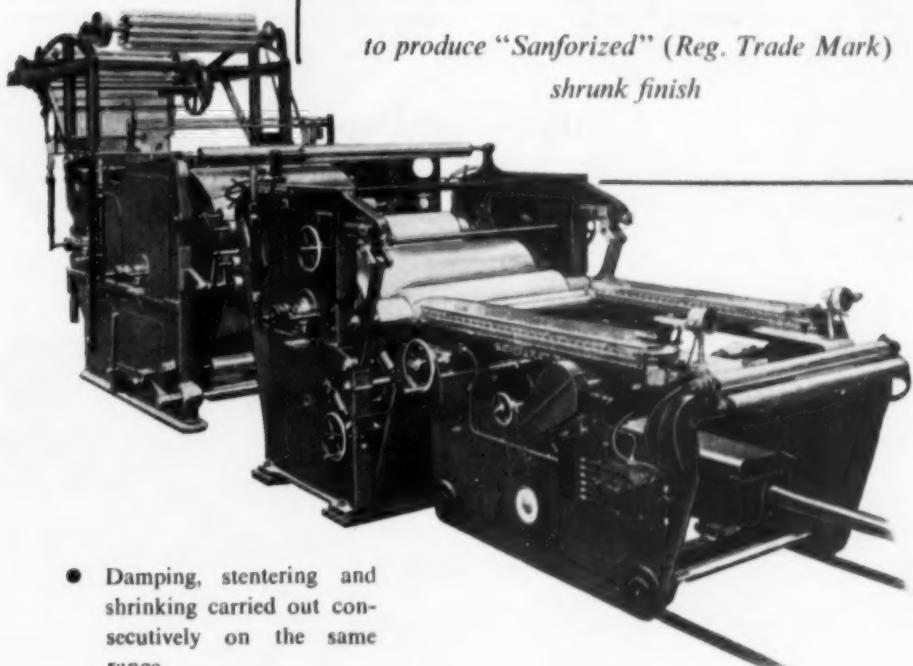
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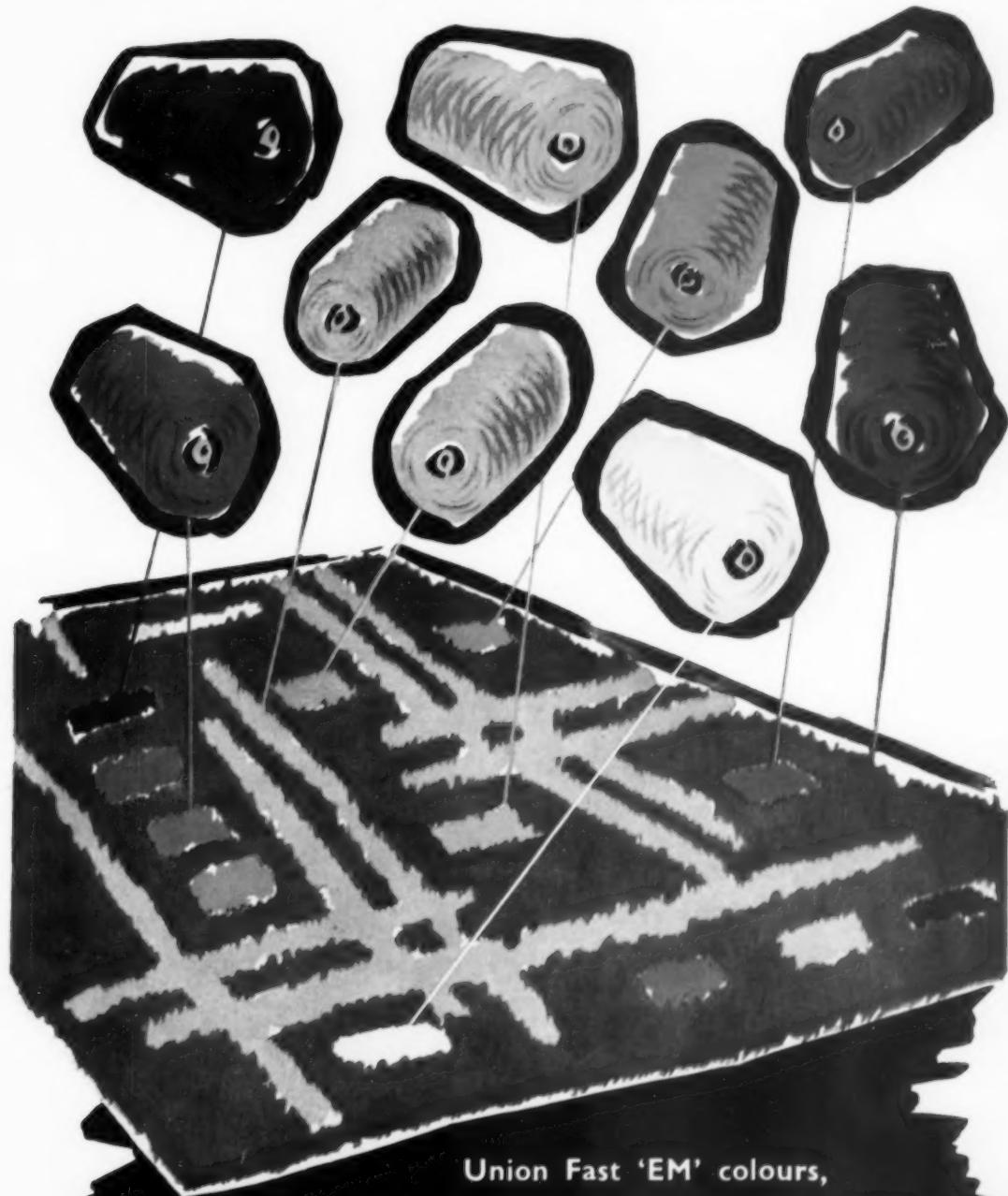
### LECTURES

A New Approach to the Continuous Dyeing of Secondary Cellulose Acetate, Cellulose Triacetate, and Terylene Polyester Fibre—the Vapocol Process *D. A. Garrett*  
 The Dyeing of Dicel and Tricel Yarns and Fabrics *H. C. Olpin and J. Wood*  
 Reactive Dyes for Textiles *T. Vickerstaff*  
 Dyeing (George Douglas Lecture) *G. S. J. White*

### COMMUNICATIONS

Relationship between Physical State and Rate of Fading of Dyes *G. Baxter, C. H. Giles, and W. J. Lewington*  
 Determination of the Migratory Properties of Direct Dyes *J. Cegarra*  
 The Flameproofing of Nylon *D. O. Douglas*  
 The Measurement of Donnan Potentials with Dyed Cellulose and Aqueous Salt Solutions *S. M. Neale and P. K. Saha*





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# THE JOURNAL OF THE Society of Dyers and Colourists

Volume 73 Number 5

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## Proceedings of the Society

### Fibro and Fibrolane in the Carpet Trade with particular reference to Dyeing

R. C. CHEETHAM

*Meeting of the Scottish Section held at the St. Enoch Hotel, Glasgow, on 25th September 1956,  
Mr. C. D. Smith in the chair*

The impact of man-made fibres on the carpet trade is discussed, and the desirable attributes of a carpet fibre are suggested. The properties and the performance of viscose rayon staple (Fibro) and regenerated protein staple (Fibrolane) are then considered in detail, some indication being given of the relative advantages of these fibres as well as any apparent disadvantages. The methods being developed to overcome these disadvantages include modifications to fibre structure as in crimped Fibro and Fibre M 55 and also treatments designed to reduce rate of soiling. Suggestions are then made regarding the composition of man-made fibre blends and reference is made to spun-dyed staple.

The scouring and the dyeing of blends consisting of Fibro and/or Fibrolane are then considered, detailed methods and selections of dyes being given for the various staples and yarns. Particular reference is made to the effect of denier on dyeing rate as it affects both staple and yarn. The absorption of direct dyes by protein blends containing Fibro is shown to follow similar lines to that by Fibro itself, but certain special considerations apply. Finally, brief reference to the dyeing of tufted carpets is followed by a summary of progress.

#### INTRODUCTION

For carpets of high quality and distinction wool has deservedly held pride of place over the years. Its natural warmth and resilience have given comfort in use, and its ability to dye easily with many of the brightest hues in the dyer's palette has brought richness and clarity to carpet designs. The properties of wool, unique in some ways, have therefore given this fibre, until comparatively recent times, an unrivalled supremacy in many forms of traditional woven carpets. It is about twenty years since the claims of wool as a carpet fibre were challenged by man-made fibres, and such has been the pace of development, even in spite of the interruption caused by war conditions, that in 1955 it was estimated that in this country over 20 million lb. of rayon staple was used as surface yarn or pile for floor coverings, compared with a consumption of about 75 million lb. of wool and hair. In three years, from 1952 to 1955, the use of rayon staple in the United Kingdom has more than trebled, and in the U.S.A. the advance of man-made fibres has been even more spectacular, the amount of rayon used having risen over a comparable period from 27 to 103 million lb. per annum.

The advance of rayon in American industry, however, coincides with the rapid development of tufting techniques, by the use of which pile carpeting can be produced 15-20 times as fast as

from conventional carpet looms. In 1955 tufted carpeting constituted over 55% of the total carpet sales in the U.S.A., and it is estimated that about 50% of the yarn used is rayon or rayon blend. Tufted carpets are now coming on the market in this country, but considered opinion in the trade and elsewhere is that it is much too early yet to measure the impact on the carpet trade in general. Still less is it possible to forecast the extent to which American experience will be paralleled in this country. Nevertheless, it would appear that a vast and promising field exists for the development of man-made fibres in the carpet industry provided that the fibre, or blend, with the desired properties can be found at the right price.

The principal fibres tried in carpets have been viscose rayon, cellulose acetate, and regenerated protein fibres, with smaller quantities of nylon and Orlon (DuP) acrylic fibre, the latter chiefly in the U.S.A. Main interest has been in providing surface yarns and pile for the carpet, as distinct from the more limited outlets as backing yarns.

A fibre like Fibrolane (Courtaulds' regenerated protein fibre) with its wool-like chemical structure and properties as well as smooth surface is well equipped for the rôle of competitor to wool, and good progress has been made in utilising this fibre in blends for conventional Wilton and Axminster types of carpeting as well as in the rapidly developing tufted and needle-loom varieties. On the other

hand, Fibro (Courtaulds' viscose rayon staple), although differing fundamentally from wool, because of its versatility coupled with an ability to respond to techniques aimed at improving the fibre properties, is already going far to meet the requirements, both technological and economic, of the carpet trade. Cellulose acetate has a more limited application, mainly because its price and properties do not make this fibre sufficiently attractive; whilst nylon has been used mainly to improve resistance to abrasion, or possibly for its prestige value, and is sometimes included in a blend up to about 10%.

It is intended in this paper to outline the properties required of a carpet fibre, to show the varying degree to which these demands are met by the principal competitors to wool in the man-made fibre field, and to indicate the trend of contemporary research. Methods of scouring and dyeing some of these fibres will then be referred to in detail.

#### PROPERTIES OF A CARPET FIBRE

Apart from the well known physical attributes of warmth, resilience, and covering power, a carpet fibre should be capable of being easily dyed to cover the whole gamut of colour required by the carpet designer. In addition, for plain carpets and to a lesser extent for ground shades, acceptable standards of levelness must be produced on dyed yarn, using machines of conventional pattern.

It should be possible to produce all colours to adequate fastness standards. The pile itself should be capable of being cleaned satisfactorily, have good resistance to wear, and possess reasonable soil resistance. A carpet fibre should have good bulking properties to enable a close, compact pile to be formed.

#### Man-made Fibres used in Carpets

Whilst some fibres are still in process of evaluation, sufficient bulk work has been done to suggest that most of the above requirements can be met, either now or in the future, by Fibro or Fibrolane. The former can be used as 100% in the pile or blended with Fibrolane and/or wool, and both man-made fibres are available in ranges of deniers and staple lengths to suit the various spinning systems.

One decided advantage is that uniformity in colour and physical properties is a feature of both fibres. Moreover, both Fibro and Fibrolane are somewhat whiter than most carpet wools, and they do not suffer from the objectionable fading faults often experienced with wool because of the comparatively low light fastness of the natural colour. It is therefore possible to obtain a full range of colours on blends containing these fibres.

A further advantage of the man-made fibres is that their dimensions can be predetermined to accommodate specific requirements in denier or staple lengths as well as in blend composition.

Manufacturers can be assured of a stable price for the raw material, which forms such a high proportion of total costs of production.

Yarns spun on the worsted, woollen, cotton, jute, and flax systems all find uses in the carpet trade.

In considering the relative merits of these various systems, apart from the characteristic properties intrinsic to each system, attention will be paid to tradition, e.g. the use in Axminster carpets of mainly woollen-spun yarns, or to cost, as in tufted productions, often utilising cotton-, flax-, or jute-spun yarns.

#### USE OF FIBRO

Fibro is now being taken into the carpet trade in substantial weights and, although its chemical structure does not suggest wool-like properties, modifications during manufacture have resulted in fibres sufficiently adaptable to find their way into the traditional weaves and at the same time to provide raw materials for floor coverings of more popular appeal, such as cords and the recently introduced tufted and needleloom carpeting.

From an early date jute-spun yarns found greatest favour because of the low conversion costs, and the use of 18- and 50-denier Fibro has been particularly well established in Brussels-type carpets.

Woollen-spun yarns, sometimes utilising the principle of mixed deniers to improve the physical attributes of the pile, have become next in importance and are used in substantial quantities for Axminster carpets, both as 100% Fibro and as blends of Fibro with wool or Fibrolane.

In the early stages of development the apparent disadvantages of Fibro in carpet pile could be summarised as a tendency to rapid soiling, lack of resilience, and insufficient surface cover. The marked advantages included improved yarn processing and greater durability of pile yarns.

As a result of modifications during manufacture, Fibro has become even more useful to the carpet trade, since the resulting changes in physical and chemical properties have conferred on it in particular a reduced tendency to soiling and greater covering power.

#### CRIMPED FIBRO

One of the modifications is crimped Fibro, in which the fibre has been given a permanent crimp by chemical means during the manufacturing process. This fibre is characterised by an unsymmetrical cross-section, having a thick skin on the one side and a thinner one on the other side (cf. Fig. 1 and 2). It is essential to stretch the fibre during manufacture, and then to relax it in water at some stage to obtain the full effect of the inherent crimp. Wet processing is therefore likely to ensure that relaxation is complete. As the degree of crimp obtained during manufacture varies according to denier and becomes less with increasing denier, the commercial production of fibres of interest to the carpet trade is centred on 8 and 15 denier.

Trials with 100% crimped Fibro carpets have demonstrated superior performance as regards resilience and bulking power, the general effect being a narrowing of the gap between Fibro and wool in these respects. A further development in which the fibre crimp has been made more pronounced is expected to be available in the near

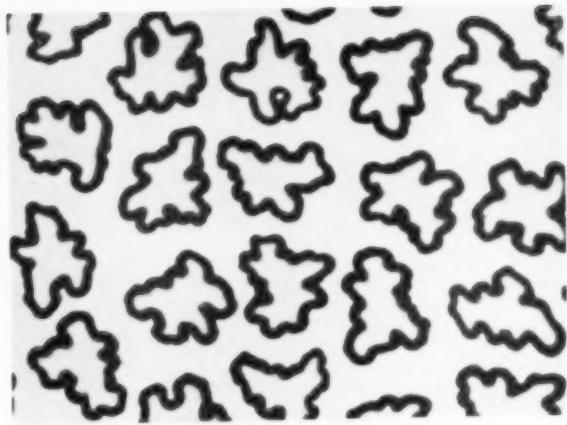


FIG. 1 — Standard Fibro

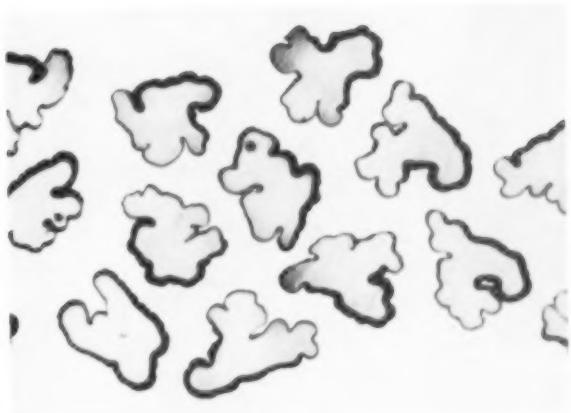


FIG. 2 — Crimped Fibro

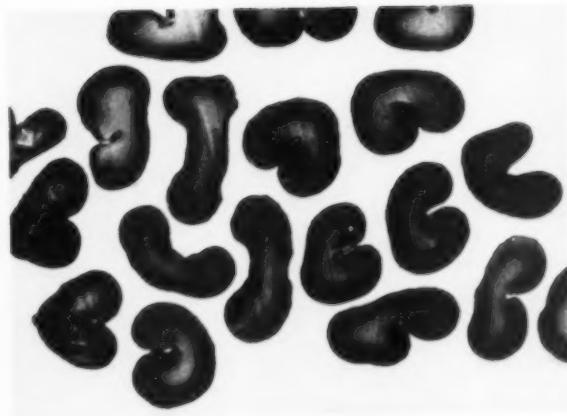
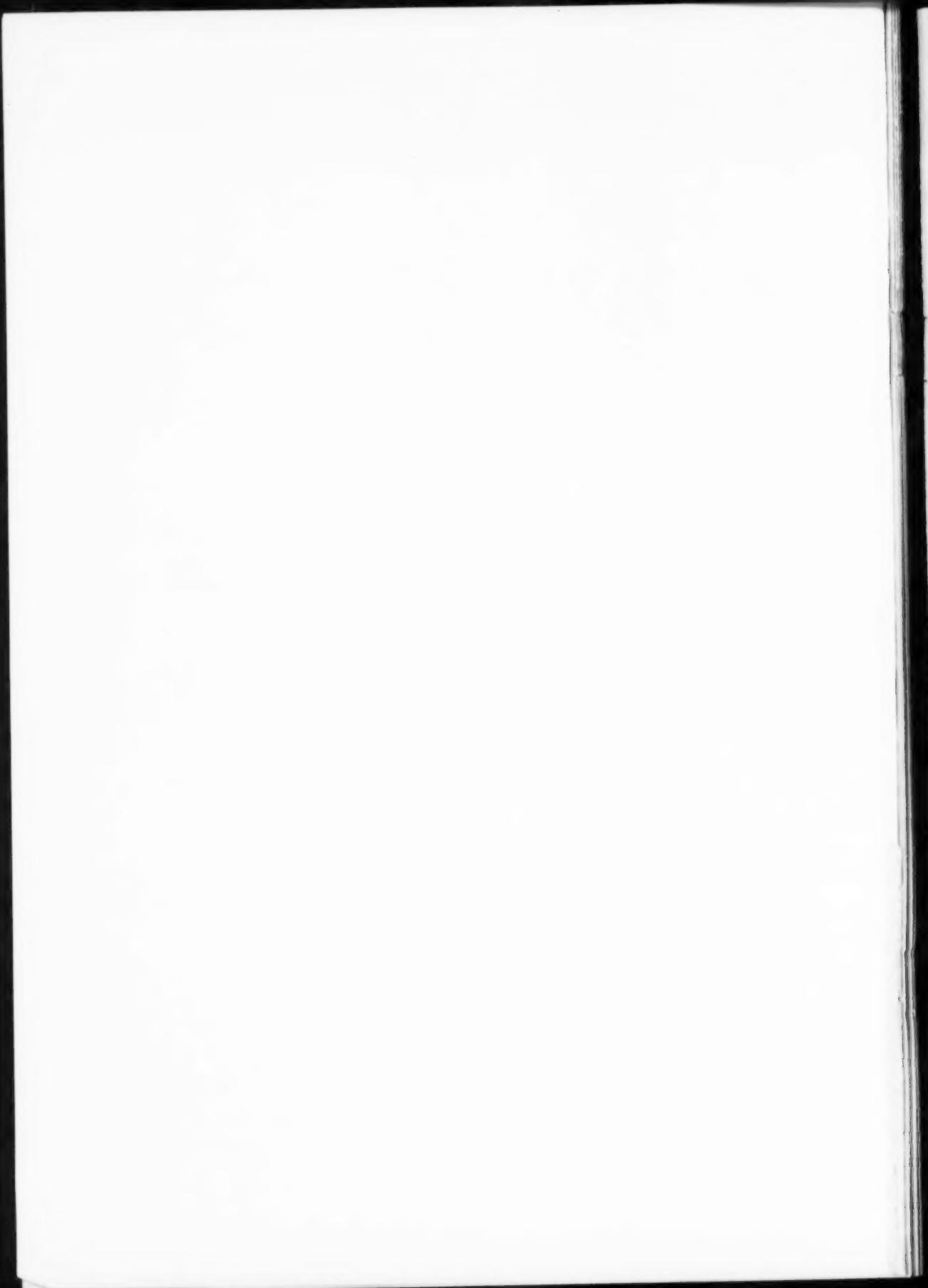


FIG. 3 — Fibre M 55



future, and should prove even more acceptable in its physical characteristics.

Thickness measurements on Wilton carpets with pile made from crimped Fibro in two qualities of yarn and from wool are given in Table I, which also includes measurements after six months' wear. It will be observed that crimped Fibro gives a pile which compares favourably with that of wool, both when new and after wear.

TABLE I  
Thickness of Pile consisting of Crimped Fibro before and after Wear

	Wool	Crimped Fibro	
	95	95	75
	yd./oz.	yd./oz.	yd./oz.
Thickness, mm.	10.4	9.25	9.05
Calculated as % of wool pile	100	89	87
Reduction after wear, %	16	20	6

An investigation of various scouring methods, using either oleine or "self-scouring" oils in conventional scouring machines as well as scouring in dyeing machines, has indicated that the crimp is maintained during all the treatments, although some "flattening" of the yarn is observed after passing through squeeze rollers. This effect is common to all rayon fibres and is associated with the high swellability compared with wool. It will be found in practice that the natural contour of the fibre is recovered during subsequent processing of the yarn and pile.

#### SOILING OF CARPETS

Recent research has also been concentrated on attempts to solve the problem of the apparently greater tendency of Fibro than of wool to soil. Any successful method aimed at retarding soiling in carpets should take into account the basic mechanism by which soiling material is held by the fibre.

In the first place soil is introduced mainly by boots and shoes but is also airborne to an appreciable degree in many industrial areas. The soiling matter, largely solid and covering a wide range in particle size, is attached and held to an extent dependent on fibre surface characteristics, on electrostatic attraction, and also on the presence of other substances on or in the fibre. One of the main factors influencing soil retention is the presence of oil on the surface pile, and often this can be attributed to the oil content of the jute backing or of the pile yarn. It has been demonstrated that carpets are much less liable to soiling after dry-cleaning. It should be remembered, however, that the reduced tendency to soiling after cleaning may be only temporary, and there is at the same time some reduced resistance to abrasion owing to removal of oil and possibly other products. It should also be remembered that Fibro and Fibrolane wet out more easily than wool.

Apart from these considerations, research has been proceeding in two directions. On the one hand a number of "anti-soiling" agents are now available and they can be applied as a final treatment to the dyed yarn. These agents are substantive and so

alter the surface properties of the yarn. Encouraging results have been obtained by the application of Syton W<sup>1</sup> or of Cirrasol AR<sup>2</sup> as a final treatment after the yarn has been dyed.

#### FIBRE M 55

A more fundamental approach is to provide the fibre with a smooth exterior surface, again entailing a chemical modification during manufacture. As a result the fibre could be expected to be less liable to hold soiling matter because of the absence of serrations. The fibre at present designated M 55 is one such development and, in addition to having a smooth exterior surface, has become more resilient and considerably tougher, the resistance to abrasion being much greater than that of ordinary Fibro. This development by Courtaulds Ltd. is still at the experimental stage, although preliminary trials have provided evidence of good covering capacity and a greatly reduced tendency to soil, and at the same time suggest that such soiling as does take place is less tenaciously retained. The cross-section of this new fibre is compared with that of standard Fibro in Fig. 1 and 3.

#### USE OF FIBROLANE

Fibrolane is supplied in two forms, designated *Fibrolane BX* and *Fibrolane BC*. The latter has been treated with a chromium salt to give improved resistance to processing liquors. Its colour is light green, which limits to some extent the range of colours that can be produced. In practice the shades obtainable are comparable with those for which darker grey carpet wools would be used. Fibrolane BX is, however, satisfactory for most purposes in the carpet trade and is mainly of interest in blends with Fibro: such blends find a useful outlet in both traditional woven carpets and the newer needleloom felts and tufted carpets. Fibrolane is also blended with wool.

Fibrolane contributes warmth and resilience, being somewhat better in these respects than Fibro. The wearing properties of blends containing Fibrolane are good, and such blends give yarns with good bulking properties. Both Fibro and Fibrolane can be stock-dyed to acceptable fastness, or the blends can be yarn-dyed and, in the case of tufted carpets, can be piece-dyed if required. In tendency to soiling Fibrolane is closer to wool than to Fibro, and owing to its smooth surface could be expected to be even better than some wools.

#### COMPOSITION OF BLENDS OF MAN-MADE FIBRES

Whilst the exact composition of blends containing various deniers has not yet been fully correlated with performance in the carpet, it would seem that a satisfactory pile with a soft feel is produced by blending 25% of 4.5-denier crimped Fibro with 50% of 15-denier crimped Fibro and 25% of 50-denier standard Fibro, whilst a slightly more bulky yarn is produced from a blend of 25% of 8-denier crimped Fibro and 75% of 15-denier crimped Fibro.

For a two-fibre blend, Fibro can be blended with wool on a 50/50 basis using, for example, 18-denier Fibro, whilst blends of 50% of 18-denier standard

Fibro and 50% of 18-denier Fibrolane provide an economical basis for many types of floor covering. In these latter blends it is possible to have a proportion of wool, and a suitable yarn can be produced from a blend consisting of 33.3% of each fibre. Another interesting possibility based on a blend of fibres having smooth surfaces is a combination of Fibrolane with Fibre M 55.

It will be appreciated that we are only yet in the early stages of development, particularly in the assessment of blends, and it may be some time before final conclusions are reached on the most satisfactory carpet fibres and the optimum blends that can be made from them.

Meanwhile it will be seen that research is proceeding on all aspects of carpet manufacturing in endeavours to meet requirements at all levels of the trade. Whilst, therefore, in some cases the inducement to consider man-made fibres will arise from economic pressures, in many other instances manufacturers will be attracted by the acknowledged superior properties of these fibres.

#### DURACOL\* SPUN-DYED FIBRES

In order to secure the advantages of greater regularity of colour, particularly in large weights, and of high fastness, increasing use is being made of the Duracol\* colour ranges in Fibro and Fibrolane, particularly for needleloom felts and tufted carpets. The available colours in 15-denier

coverings, or Fibro-Duracol can be blended with stock-dyed wool to produce an economically coloured yarn.

#### Scouring and Dyeing of Man-made Fibres and Blends

The scouring and dyeing methods given in this part of the paper are applicable to equipment normally used in the carpet and ancillary trades. Scouring is done in brattice or tape multibowl units or in dolly or Hussong machines. In general, staple is dyed in machines of the Obermaier type or in many other machines designed for loose wool. Yarn is almost invariably dyed in the Hussong type of machine, whilst piece-dyeing is done on a winch, suitably constructed to withstand the strains imposed by heavy loads.

Fibro can be dyed to satisfactory standards as staple or yarn, either as 100% fibre or in blend yarns with wool or Fibrolane, and in piece goods. In the last named instance Fibro often occurs as 100% pile but is also found blended with Fibrolane or possibly wool.

In practically all cases direct dyes are used for Fibro, being applied in combination with aggregated or metal-complex acid dyes for blends containing both Fibro and a protein fibre. Fibrolane itself is dyed as staple with similar acid dyes to those used for blends with Fibro, and with levelling acid dyes for blends with wool.

TABLE II  
Fastness Properties of Fibro-Duracol and Fibrolane-Duracol

Colour	Fibre	Fastness			
		Light (Fade-Ometer)	Washing S.D.C. No. 2 <sup>3</sup>	Dry Cleaning <sup>4</sup>	Solvent Spotting <sup>5</sup>
Peony Red	Fibro	7-8	5	5	5
	Fibrolane	7	5	5	5
Reseda Green	Fibro	7-8	5	5	5
	Fibrolane	7	5	5	5
Dove Grey	Fibro	7-8	5	5	5
	Fibrolane	6-7	5	5	5
Beige	Fibro	6	5	5	5
	Fibrolane	6-7	5	5	5
Mushroom	Fibro	6-7	5	5	5
	Fibrolane	5-6	5	5	5
Copper	Fibro	7-8	5	5	5
	Fibrolane	6-7	5	5	5

crimped Fibro and in 18-denier Fibrolane are illustrated in Table II, which includes also some fastness properties of particular interest to the carpet trade. The fastness of Duracol fibres fully meets the requirements of carpet manufacturers, and the high consistency of colour means that these fibres can be blended more effectively than stock-dyed fibres, which normally have a lower standard of levelness. Large weights of a particular colour can be supplied.

Duracol fibres are being blended with each other and also with wool. For example, Fibro-Duracol and Fibrolane-Duracol, on a 50/50 basis, provide blends of high fastness for many forms of floor

#### DYEING OF FIBRO STAPLE

Fibro supplied to the carpet trade includes a preponderance of coarser fibres such as 9, 18, and 50 denier for the standard fibre or 8 and 15 denier for the crimped fibre.

Such deniers offer few difficulties in most wool loose-stock dyeing machines, although the highest degree of levelness is obtained in machines with good liquor flow, such as the Obermaier type. Such a machine is cylindrical and has a liquor flow from the centre to outside, and usually only one-way flow is employed; this is actually advantageous for the dyeing of staple in this machine, since the fibre mass is kept in an open a state as possible, thus allowing maximum passage of liquor.

The staple is packed dry in a separate container,

\* Duracol is the trade-mark used by Courtaulds Ltd. to denote their yarns and fibres which have been spun-dyed.

the maximum capacity of this type of machine being about 300 lb. depending on the denier and the nature of the fibre. The loaded container can then be lowered into the actual machine, which contains the dye liquor. Some contraction in volume takes place when the fibres are wetted out, so that, wherever possible, cover adjustments should be made to ensure freedom from channelling.

Direct dyes of the required light fastness are chosen, and usually no aftertreatment is necessary for the coarser deniers. Certain darker colours on 4.5-denier Fibro would benefit from an after-treatment with an agent designed to improve wet fastness, e.g. Fibrofix (Courtaulds), Fixanol (ICI), Sandofix (S), or similar agent, although possible effects on light fastness should be borne in mind. Mainly Class B dyes (S.D.C. classification of direct dyes) are used because of their satisfactory wet fastness, although it may be possible to use Class A dyes for certain of the lighter colours, whilst darker colours can often be obtained economically with some of the Class C dyes.

The chief fastness requirement, apart from light, is fastness to scouring after the staple has ultimately been converted to yarn. It is also important to achieve satisfactory fastness to water-spotting, more particularly if the staple is required for plain carpet, and to cleaning and washing treatments if the dyed staple is likely to find its way into design carpets. Carpet Fibro is supplied clean and needs no scouring or preliminary wetting out.

#### Dyeing Method

The dry Fibro is entered into the dye liquor at about 85°C., and the dye liquor is raised to the boil in 15 min. and maintained at this temperature; the total dyeing time does not usually exceed 75 min.

The required amount of common salt, according to depth of colour and type of dye, is added in three or four equal portions during dyeing. Generally speaking, coarser-denier staple is less difficult to dye than finer deniers, since less resistance is offered to liquor flow, even though this is offset to some extent by the tendency for a coarse denier to level less readily.

It is well known that fibre denier has a distinct effect upon the appearance of dyed fibres. Thicker fibres appear more deeply dyed than thinner ones containing the same amount of dye. Conversely, to dye two fibres of different denier to the same depth of colour requires more dye on the thinner or finer fibre than on the thicker one. The exact relationship between the amounts of dye required to dye two fibres of different deniers to the same depth was given by Fothergill<sup>6</sup>—

$$\frac{A_1}{A_2} = \sqrt{\frac{d_2}{d_1}}$$

where  $A_1$  and  $A_2$  are the amounts of dye (actually on the fibre) required for fibres of deniers  $d_1$  and  $d_2$ . This relationship holds for any two fibres of similar type, e.g. two bright fibres or two matt fibres, but should not be used to compare a bright fibre of one denier with a dull fibre of different denier. This effect is referred to again under the dyeing of Fibro yarns, which often contain a mixture of deniers.

A sequestrant can be used, the maximum effect being obtained with the ethylenediaminetetra-acetic acid (E.D.T.A.) type of agent, which does not decompose at high temperatures. The amount required depends on the condition of the water supply, and for water of 2-3° hardness we find that 2½ oz. of 100% E.D.T.A. per 100 gal. of water is satisfactory. With copper-containing dyes it is not advisable to use this reagent, but Calgon may be used.

Wherever dyes are known to be susceptible to reduction, an addition of 0.5-1% ammonium sulphate should be made to the dyebath. Such an addition will help to avoid inconsistent results and abnormal colour changes.

#### Selection of Dyes

##### FAWNS OR BROWNS

##### Colour Index No.

Solophenyl Brown GL or RL (Gy) C.I. Direct Brown 115 or 116

Benzanil Fast Brown 8RLL (YDC) shaded with—

Chlorantine Fast Orange TGLL (CDC) C.I. Direct Orange 34

Durazol Blue 2R (ICI) C.I. Direct Blue 71

##### PINKS AND REDS

Durazol Red 6B (ICI) C.I. Direct Red 79

Chlorazol Fast Red F (ICI) (dark colours only) C.I. Direct Red 1

Chlorantine Fast Red K (CDC) C.I. Direct Red 81 shaded with—

Durazol Helio B (ICI) C.I. Direct Violet 51

Durazol Blue 2R (ICI) C.I. Direct Blue 71

##### BLUES

Chlorantine Fast Blue 4GL (CDC) C.I. Direct Blue 78

Durazol Blue 2GN (ICI) C.I. Direct Blue 76

##### GREENS

Chlorantine Fast Green BLL (CDC) C.I. Direct Green 26

Chlorazol Dark Green PL (ICI) (dark colours only) C.I. Direct Green 1

##### GREYS

Chlorantine Fast Orange TGLL (CDC) C.I. Direct Orange 34

Durazol Blue 2R (ICI) C.I. Direct Blue 71

or

Solar Orange RGL (S) C.I. Direct Orange 62

Chlorantine Fast Blue 4GL (CDC) C.I. Direct Blue 78

#### DYEING OF FIBROLANE STAPLE

The essential difference between dyeing Fibrolane and dyeing Fibro is that dyebaths should be maintained slightly acid. Generally speaking, aggregated or metal-complex acid dyes are used.

Care should be taken to ensure that any alkalinity in the water supply is neutralised with acetic acid, and the dyebath then set with sodium acetate and acetic acid, sufficient to maintain the appropriate pH for the dye being used. The dyeing of Fibrolane staple is dealt with fully in a recent publication<sup>7</sup>.

#### Selection of Dyes

##### FAWNS AND BROWNS

##### Colour Index No.

Irgalan Brown GL (Gy)

C.I. Acid Orange 51

Coomassie Fast Brown R (ICI)

C.I. Acid Brown 49

shaded with—

Benzyl Fast Yellow R8 (CDC)

—

## PINKS AND REDS

Azo Rubinol 3GP (S) (pinks only)	—
Polar Red R (Gy)	C.I. Acid Red 99
Chlorazol Fast Red F (ICI) (dark colours only)	C.I. Direct Red 1

## BLUES

Brilliant Alizarine Milling Blue BL (S)	C.I. Acid Blue 80
Cloth Fast Blue RN (CDC)	C.I. Acid Blue 113

## GREENS

Alizarine Brilliant Green G cone. (LBH)	C.I. Acid Green 25
Carbolan Brilliant Green 5G (ICI)	C.I. Acid Green 28
Carbolan Green G (ICI)	C.I. Acid Green 27

## GREYS AND BLACKS

Cibalan Grey BL (CDC)	C.I. Acid Black 60
Coomassie Fast Black G (ICI)	C.I. Acid Black 21

## SCOURING OF FIBRO AND OF FIBRO-WOOL, FIBRO-FIBROLANE, AND FIBROLANE-WOOL BLENDS

Traditionally the scouring of carpet yarns has been effected with soap and soda ash in the conventional multibowl scouring machines. Yarns spun on the woollen system, constituting a major proportion of those used in carpets, have usually been prepared with oleines, thus necessitating scouring liquors of  $\text{pH} > 8$ , and involving the use of heavy squeeze rollers to ensure efficient standards of oil removal, particularly important in carpet pile yarns.

Whilst wool may require such treatments, it will be found that man-made fibres such as Fibro and Fibrolane hold oil, grease, and dirt much less tenaciously, and consequently milder scouring conditions are possible. Scouring is facilitated even more by the use of "self-scouring" oils, which consist in the main of mixtures of mineral oil and a detergent, and are so constituted that a practically neutral scouring liquor is all that is necessary<sup>8</sup>. In practice such a liquor can consist of Lissapol N (ICI) and sodium bicarbonate, which have been found efficient for carpet yarns containing Fibro or Fibrolane.

The use of easily removable oils will also ensure, in the case of man-made fibres sensitive to alkali, that scouring can subsequently be accomplished with minimum damage to the yarn.

A logical development is a yarn spun with the aid of an auxiliary product drawn from the group of softening agents, whereby scouring may be eliminated altogether. For example, research has indicated that Ahcovel R, an anionic softener made by Arnold, Hoffman & Co. Inc. (U.S.A.), can be applied in amounts not exceeding 1.5% on the weight of staple. The additional use of Syton (Monsanto) is recommended to reduce possible fibre slippage, which would affect the tensile strength of the yarn<sup>9</sup>. In this country, interesting results have been obtained by spraying staple with an aqueous solution of Cirrasol AR (ICI); the method can be used for Fibro and for blends containing Fibro, Fibrolane, or wool. The yarn can then be entered directly into the dyebath without preliminary scouring, but it is advisable to wet out the yarn, preferably in the dyeing machine. A

proportion of the agent finds its way into the dye-bath, and our own tests have shown that dye absorption is slightly reduced. Whilst experiments on these lines have been limited, the results so far appear promising, and possible additional advantages such as reduced tendency to soiling are also being investigated.

Because of the greater degree of control over the hanks, the tape continuous scouring machine is to be preferred to the brattice type of machine for scouring man-made fibre carpet blend yarns, as there is less chance of roller slippage and consequent possible cutting of hanks. This refers particularly to yarns composed wholly of man-made fibres. On either machine it is important to reduce squeeze roller pressures, since both Fibro and Fibrolane are highly swellable fibres, particularly in alkaline liquors. With the latter, fibre swelling can be controlled to some extent by adjusting pH, and it is desirable to ensure a final acidifying treatment at about pH 4, so as to confer maximum tensile strength on the yarn and to reduce drying time to a minimum. The latter consideration applies only when scoured yarns are not to be dyed within a reasonable time.

These developments in scouring would also be advantageous in the case of wool, since the possibility of alkali damage or discolouration would be diminished.

## DYEING OF FIBRO YARNS

100% Fibro yarns may consist of blends of various deniers ranging from 4.5 to 50, and dyeing procedure should aim at maximum solidity of colour. In addition to the effect of denier upon depth of colour (see above), it also has a marked effect on the uptake of dye by fibres: under any given conditions heavy deniers dye more slowly than fine deniers.

If the rate of dyeing of the finer-denier fibre can be maintained sufficiently high, the increased colour value obtainable on the heavy-denier fibre is counterbalanced to some extent. In direct dyeing it is common practice to add salt in portions during the dyeing, so as to control dyeing rate, but it may be advantageous in dyeing mixed deniers to add a portion of salt at the beginning of dyeing and to control the rate of dyeing by temperature alone, and this possibility is being explored. On the other hand, very high dyebath exhaustions should be avoided, since under these conditions the difference in rate of dyeing between finer and coarser deniers is altered, and dye might then be transferred from the fine to the heavier-denier fibre.

Levelness of colour calls for greater care with direct dyes on Fibro than with levelling acid dyes on wool, particularly in the Hussong machine. Careful selection of dyes is necessary. Maximum use should be made of Class A dyes, particularly in lighter colours, where subsequent dye migration is not likely to present any difficulty. The darker colours may require an aftertreatment with a fixing agent as for staple if Class A dyes are used, but such treatments are not usually required in the case of Class B or Class C dyes, with the possible exception of full reds.

Yarns can be dyed in hanks or as packages, but the former procedure is more usual in the carpet trade, partly because the leaner yarns resulting from package dyeing have a more limited use. The machine in general use is the Hussong type, but Obermaier dyeing machines can be used as for staple, and there is some evidence that the levelness of colour and the condition of the dyed yarn are superior with the latter type of machine. One serious disadvantage is that only much smaller weights can be dyed than in the Hussong machine. Compared with wool yarns Fibro yarns are less bulky when wetted out, and consequently it is more difficult to ensure an optimum load free from channelling. In this respect the package machine has a decided advantage.

#### Dyeing Method

Generally speaking, the initial temperature for applying Class A or Class B dyes is around 85°C., the dyebath then being raised to the boil. In the case of Class C dyes the initial temperature is 40°C. and the temperature is raised gradually to the boil. As is well known, these latter dyes are sensitive to electrolytes, and it is advantageous to use the more concentrated brands of dyes and to avoid the use of hard water. Salt should be added carefully in the appropriate amounts according to the individual dye and the depth of colour. Usually several small amounts are added, or preferably additions of salt solution should be made gradually by controlled means over a period.

The selection of dyes for Fibro yarns is similar to that for staple, but closer attention should always be paid to the levelling properties of the dyes, and to the precise conditions of dyeing it is intended to employ.

A sequestrant can be used, as for Fibro staple, and it has been shown that such an agent is beneficial for the dyeing of Fibro yarns in Hussong machines with direct dyes in hard water.<sup>10</sup>

#### DYEING OF FIBRO-WOOL AND FIBRO-FIBROLANE BLEND YARNS

The methods of dyeing these two blends are similar and involve combinations of direct dyes and aggregated or metal-complex acid dyes applied together in a single-bath process. Direct dyes which stain protein fibres least should be used, and it is also desirable to employ auxiliary agents such as Calsolene Oil HS (ICI) or Lissapol N (ICI) in the dyebath. Again, dyebath conditions affecting levelness are much more critical than is the case with levelling acid dyes on wool, particularly as it is often necessary to manipulate two different classes of dye in the same dyebath.

Certain direct dyes, e.g. Chlorazol Dark Green PL (ICI) and Chlorazol Fast Red F (ICI) are absorbed by both the Fibro and the protein fibre, and whilst these provide a convenient method of obtaining solid shades economically, only dark colours are normally produced by this means, partly because light fastness would be insufficient in lower depths, but also because technically solidity of colour is more conveniently achieved by applying, as far as possible, the appropriate

dye to the respective fibre, thus allowing the two fibres to be dyed independently.

In order to illustrate the behaviour of direct dyes as classified by the Society, a representative dye has been selected from each class, and applied to separate fibres of Fibro and wool in the one case, and Fibro and Fibrolane in the other. Absorption curves for both mixtures have been drawn on the same graph in each case. Each series of dyeings was carried out at 3% depth with the addition of Glauber's salt. Dyeing was continued at 90°C. for 2 hr., during which time small samples of dyed material were withdrawn periodically, and dye subsequently removed from the fibres by extraction with pyridine.

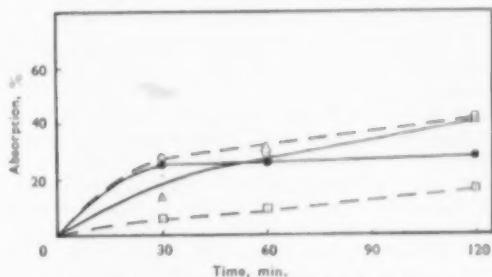


FIG. 4—3% Durazol Red 2B (C.I. Direct Red 81) (Class A)

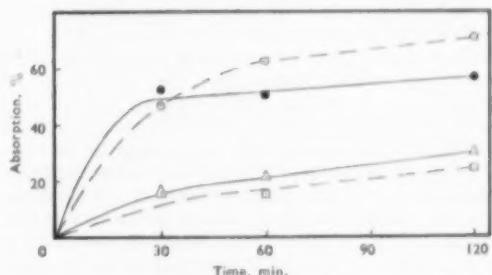


FIG. 5—3% Diphenyl Chlorine Yellow FF (C.I. Direct Yellow 28) (Class B)

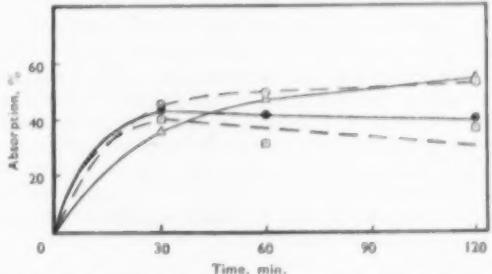


FIG. 6—3% Chlorazol Dark Green PL (C.I. Direct Green 1) (Class C)

—○— Fibro  
—□— Fibrolane  
—△— Wool  
—○— Fibro + Wool dyed together  
—○— Fibro  
—△— Wool dyed together  
All + 20% salt, dyed at 90°C.

FIG. 4-6—Absorption of Direct Dyes by Fibro, Fibrolane, and Wool

Fig. 4-6 illustrate the relative absorptions on the two blends of different classes of direct dyes, using salt only. It will be observed that there is no

TABLE III  
Dyebath Exhaustion (%) on Fibro-Wool (F-W) and Fibro-Fibrolane (F-Fl)

Time (min.)	Durazol Red 2B (ICI) (C.I. Direct Red 81) (Class A)		Diphenyl Chlorine Yellow FF (Gy) (C.I. Direct Yellow 28) (Class B)		Chlorazol Dark Green PL (ICI) (C.I. Direct Green 1) (Class C)	
	F-W	F-Fl	F-W	F-Fl	F-W	F-Fl
30	39	33	68	63	80	85
60	56	48	71	77	89	81
120	69	58	86	94	95	90

significant difference between the two blends, so that, generally speaking, the same dyeing technique could be used for both. These figures, together with Table III, showing percentage dyebath exhaustion, indicate some general characteristics of the various classes of dyes.

The Class A dye has similar absorption on wool, Fibrolane, and Fibro (Fig. 4), and for all practical purposes near-solidity of colour could be obtained on the blends without the use of acid dyes. Class B dyes are characterised by an appreciably higher affinity for Fibro than for protein fibre (Fig. 5), and also overall dyebath exhaustion is greater than for Class A dyes (Table III). It would not be possible to secure solidity of colour in blends by the use of Class B direct dyes only. It will be noted that solidity is as readily obtainable with Class C as with Class A dyes, but the dyebath exhaustion is high, and the bath is appreciably more rapidly exhausted than is the case with a Class A dye.

This work seems to show that some of the well known principles concerning the absorption of direct dyes by cellulosic fibres apply equally well in the dyeing of blends. There are, however, special considerations, such as the reservation of protein fibres by direct dyes. It is known that ammonium sulphate is effective in preventing dye reduction, but its general tendency is to increase absorption of dye by the protein fibre, which is undesirable where combinations of direct and acid dyes are being used. This can be countered by adding Calsolene Oil HS, and it was observed that the use of both ammonium sulphate and Calsolene Oil HS, whilst preventing dye reduction, also resulted in effective reservation of the protein fibre.

Experience has shown that careful temperature control is essential, since, in addition to direct dyes, it is often necessary to use aggregated acid dyes, and it should be remembered that these dyes as well as many direct dyes have extremely low migration properties on protein fibres. For this reason it is preferable to make maximum use of Class A dyes, for salting-on.

#### Dyeing Method

The essential features are temperature control, careful additions of salt, and efficient preparation of laboratory recipes.

The yarn is entered at 50°C. and the temperature raised gradually to 95°C. in 45–60 min., although there is no objection to a short period at the boil in order to ensure better levelling. A proportion of salt is added at the start of dyeing, and if further additions are required small quantities

should be used over a period. Ammonium sulphate (0.5–1.0%) is added at the start of dyeing, and in the case of Fibrolane–Fibro blends the use of Calsolene Oil HS (2 g./litre) is particularly desirable.

It is advantageous, from the point of view of wet fastness, to give a final wash in 1% salt solution to which has been added, in the case of Fibrolane blends, sufficient acetic acid to give pH 4.

Darker colours may call for an aftertreatment designed to improve wet fastness on the lines of previous recommendations for Fibro staple and yarns.

#### Selection of Dyes

FAWNS OR BROWNS	Colour Index No.
For Fibro	
Solar Orange RGL (S)	C.I. Direct Orange 62
Durazol Orange 2G (ICI) shaded with—	—
Colorantine Fast Blue 4GL (CDC)	C.I. Direct Blue 78
For Wool or Fibrolane	
Carbolan Fawn R (ICI) or	C.I. Acid Brown 49
Cibalan Brown GL (CDC) shaded with—	—
Cibalan Yellow GRL (CDC)	C.I. Acid Yellow 116
or	
Coomassie Fast Brown R (ICI) shaded with—	C.I. Acid Orange 51
Solway Blue RN (ICI)	C.I. Acid Blue 47
PINKS OR REDS	
For Fibro, Fibrolane, or Wool	
Chlorazol Fast Red F (ICI)	C.I. Direct Red 1
Chlorazol Fast Scarlet 8B (ICI)	C.I. Direct Red 26 (medium and dark colours only)
For Fibro	
Chlorantine Fast Red 6BLL (CDC)	C.I. Direct Red 79
For Wool or Fibrolane	
Coomassie Red PG (ICI)	C.I. Acid Red 85
Fast Acid Violet A2R (LBH)	—
or	
Carbolan Crimson 3B (ICI)	C.I. Acid Red 139
BLUES	
For Fibro	
Durazol Blue 2R (ICI)	C.I. Direct Blue 71
or	
Chlorantine Fast Blue 4GL (CDC)	C.I. Direct Blue 78
For Wool or Fibrolane	
Solway Blue RN (ICI)	C.I. Acid Blue 47
or	
Solway Ultra Blue B (ICI)	C.I. Acid Blue 25

OLIVE GREENS		Colour Index No.
<i>For Fibro</i>		
Chlorantine Fast Olive Green EGGL (CDC)	—	
or		
Sirius Supra Olive GL (FBy)	C.I. Direct Green 23	
<i>For Wool or Fibrolane</i>		
Cibalan Green GL (CDC)	C.I. Acid Green 43	
shaded with—		
Cibalan Yellow GRL (CDC)	C.I. Acid Yellow 116	
GREENS		
<i>For Fibro</i>		
Solophenyl Blue Green BL (Gy)	C.I. Direct Green 27	
shaded with—		
Solar Yellow 2R (S)	C.I. Direct Yellow 43	
<i>For Wool or Fibrolane</i>		
Carbolan Green G (ICI)	C.I. Acid Green 27	
shaded with—		
Carbolan Yellow R (ICI)	C.I. Acid Yellow 71	
<i>For Fibro (alternative)</i>		
Chlorantine Fast Yellow 8L (CDC)	C.I. Direct Yellow 50	
shaded with—		
Chlorantine Fast Blue 4GL (CDC)	C.I. Direct Blue 78	
<i>For Wool or Fibrolane (alternative)</i>		
Carbolan Brilliant Green 5G (ICI)	C.I. Acid Green 28	
shaded with—		
Carbolan Yellow 4G (ICI)	C.I. Acid Yellow 70	
GREYS		
<i>For Fibro</i>		
Solar Orange RGL (S)	C.I. Direct Orange 62	
Durazol Blue 2R (ICI)	C.I. Direct Blue 71	
<i>For Wool and Fibrolane</i>		
Cibalan Orange RL (CDC)	C.I. Acid Orange 88	
Cibalan Grey BL (CDC)	C.I. Acid Black 60	

#### Union Dyes

Some yarn dyers prefer the use of union dyes for blends of wool and Fibro or of Fibrolane and Fibro, and provided that acceptable standards of fastness, levelness, and solidity of colour can be met by this means, there is no technical objection to their use. It is, however, usually essential to employ individual shading dyes similar to those already recommended.

Union dyes being used in the trade include Uniphenyl and Union Fast SL (Gy), Solasan (S), Union Fast VLL (CDC), and Durazol Union (ICI).

#### DYEING OF FIBROLANE-WOOL BLEND YARNS

The dyeing of these blends is similar to the dyeing of wool in that levelling acid dyes can be used.

In the case of Fibrolane BC-wool blends, normal wool-dyeing methods are applicable, but the colour of the blend limits the colours obtainable to blacks, dark browns and drabs, ruby or dark reds, and full blues and greens.

Fibrolane BX is less resistant to boiling acid liquors below pH 4, and it is therefore advisable to select levelling acid dyes with neutral-dyeing properties and to dye in the presence of either formic acid at 90°C. or acetic acid without restriction of temperature.

Most colours are obtainable on Fibrolane BX blends by the use of the following dyes—

	Colour Index No.
Xylene Light Yellow 2GP (S)	C.I. Acid Yellow 29
Kiton Orange II (CDC)	C.I. Acid Orange 7
Azo Rubinol 3GP (S)	—
Solway Rubinol R (ICI)	C.I. Acid Red 80
Xylene Fast Red 3BP (S)	—
Kiton Fast Blue CR (CDC)	C.I. Acid Blue 47
Solway Blue BGA (ICI)	—

For Fibrolane BC blends the following dyes can be used—

	Colour Index No.
Xylene Light Yellow 2G (S)	C.I. Acid Yellow 17
Tartrazine N (ICI)	C.I. Acid Yellow 23
Naphthalene Fast Orange 2G (ICI)	C.I. Acid Orange 10
Kiton Fast Red 2BGL (CDC)	—
Erio Green B (Gy)	C.I. Acid Green 16
Naphthalene Scarlet 4R (ICI)	C.I. Acid Red 18
Kiton Fast Blue PCF (CDC)	—

#### DYEING OF TUFTED CARPETS

Tufted carpets are piece-dyed, for reasons of flexibility, but are also made from stock-dyed or spun-dyed staple. Manufacturers in the U.S.A. seem to have favoured piece-dyeing, but again it is by no means certain that American practice will be followed to the same extent in this country<sup>11</sup>.

In the case of tufted carpets made from coloured yarns there is no difficulty in producing the required fastness either by the use of Duracol fibres or by stock-dyeing, and in the latter case the general recommendations for staple-dyeing Fibro or Fibrolane would apply.

#### Summary of Progress

The processing of pile yarns and the making of carpets have essentially been built up around wool, and hence machinery and methods have been designed to accommodate this fibre.

In addition to wool we now have viscose rayon, regenerated protein, and other fibres, each with their own intrinsic properties, which in turn has meant a replacement of the hitherto commonly used levelling acid dyes by the less familiar direct, metal-complex, and aggregated acid dyes, sometimes in combination with each other. Consequently, dyeing techniques have had to be evolved for particular blends, and concurrently it has become necessary in many cases to alter ancillary treatments such as scouring and sizing.

Methods and machines are being designed to accommodate these new fibres and blends and to exploit novel processes of carpet manufacture, so that it seems likely that the carpet trade will share in the technological advances now taking place in many branches of the textile industry. Success will be ensured partly by the combined research work now being undertaken by the manufacturers of fibres, dyes, and other products and also by the energy displayed by the carpet trade in assimilating new techniques.

\* \* \*

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#### References

- 1 Monsanto, "The Application of Syton to prevent Soiling of Textiles" (*Laboratory Report 5411*).
- 2 ICI, "Cirnaol AR" (*Auxiliary Products Pamphlet No. 99*).
- 3 Fastness Tests Co-ordinating Committee, J.S.D.C., **71**, 339 (1955).
- 4 *Idem, ibid.*, **71**, 306 (1955).
- 5 Butterworth, E., and Chiley, A. S., *J. Textile Inst.*, **45**, p. 427 (1954).
- 6 Fothergill, F., J.S.D.C., **60**, 93 (1944).
- 7 Cheetham, R. C., *Dyer*, **115**, 1043 (1956).
- 8 Anon., *Fibres*, **14**, 313 (1953).
- 9 Arnold, Hoffmann & Co. Inc., *Technical Bulletin No. 12*.
- 10 Campbell, M. V., J.S.D.C., **66**, 120 (1950).
- 11 Woodruff, J. A., *Amer. Dyestuff Rep.*, **44**, P 636 (1955).

#### Discussion

Mr. H. R. CRONE: We had a very high proportion of ends down when mule-spinning our early experimental blends of Fibro and Ardil (ICI). These were 50:50 blends, the Fibro dimensions being, as far as I can recollect, 18 denier, 4 in. and 22 denier, 4 in. respectively. These breaks were due only to a small extent to fibre breakage, and were in the main due to the fibres simply pulling away from each other, neither fibre having lateral irregularities to provide the friction given in wool by the scale structure. We got over the trouble by decreasing the draft, but we did agitate at the time for crimp to be inserted in the fibres. Both fibres had some natural "waves", but we felt that a definite crimp, preferably of small amplitude, would go quite a long way to improving mutual fibre grip. It appears that this is now being done with Fibro and Fibrolane, and I would be interested to know whether an improvement in mule-spinning performance has resulted.

Mr. CHEETHAM: We do not know of any difficulties in spinning carpet yarns from blends containing Fibro or Fibrolane.

Mr. R. BAXTER: With reference to the rapid soiling of Fibro carpet yarns, there has for long been a school of thought which attributed this to the "wicking" of oil from the jute backing. A simple dry cleaning has shown that a carpet so treated soils less rapidly, suggesting that the oil exerts some influence. Does the speaker favour this wicking theory and, if so, can he suggest why jute yarn normally used for backing, containing possibly upwards of 5% mineral oil, is not replaced with a so-called stainless yarn, having a maximum oil content of 1%?

Mr. CHEETHAM: I agree that soiling is partly attributable to the wicking of oil from the jute backing, and we are at the moment carrying out trials with jute yarns of low oil content.

Mr. J. A. YOUNG: In the case of a deep red tufted carpet with 100% Fibro pile which is dyed

with a direct dye for price reasons, what happens when it gets dirty? A direct red of that depth cannot be washed without bleeding very severely, and I believe that it cannot be dry-cleaned because of the rubber backing. What does one do when the carpet requires cleaning?

Mr. CHEETHAM: The red carpet referred to should be treated with a cleansing liquid based on a synthetic detergent, and if there were some loss of dye this would not be a serious matter, since the carpet is plain.

Mr. W. H. LYLE: Does not the introduction of crimp into the yarn act counter to the smoothing of the irregular cross-section as regards its tendency to retain soiling matter?

Mr. CHEETHAM: The crimp of a yarn and the cross-section of the component fibres are quite distinct from each other, for whereas crimp is associated with the resilience of the pile, cross-sectional contour has a profound influence on the deposition of soil on the fibre. Consequently the two are not directly related as regards soiling.

Mr. A. W. BLAIR: It is well known that heavy deniers of matt viscose rayon tend to show a degree of lustre after dyeing in dark colours, and where the fibre is blended with wool, this contrasts unfavourably with the dull wool. Does the lecturer know of any treatment which can be applied during or after stock-dyeing or yarn-dyeing which would restore the original dullness of the matt viscose rayon?

Mr. CHEETHAM: The well known lustre shown by fibres dyed to dark colours is due primarily to heavy build-up of pigment or dye in the fibre structure, which alters the reflectance of the coloured fibre. There is no known treatment which will restore the dull appearance of a matt fibre so dyed.

Mr. G. HIGGINS: How has a deep red of adequate light and wet fastness been obtained with fast-to-light direct dyes?

Mr. CHEETHAM: The tufted carpet referred to has been made from viscose rayon dyed with a combination of Chlorazol Fast Red F (C.I. Direct Red 1) and Direct Fast Scarlet SE (C.I. Direct Red 23); if necessary, wet fastness could be improved by an aftertreatment with one of the proprietary fixing agents. Alternative methods could be based on Durazol Brilliant Red B (C.I. Direct Red 80) or Solar Red 2BL (C.I. Direct Red 79).

Mr. J. GAILEY: (1) Mr. Cheetham stated that high circulation rate was necessary to get the most level results in pack dyeing. Has he any quantitative information on this point? Has any quantitative relationship been established between fibre and yarn denier and liquor flow rate?

(2) Are any particular method of packing and arrangement of hanks in the pack basket dyeing machine recommended?

(3) The lecturer mentioned that the addition of ammonium sulphate helped to prevent reduction of direct dyes by reducing groups in the cellulose. Is this because of the buffering action of ammonium sulphate, or has it some other action?

Mr. CHEETHAM: (1) We have no quantitative information on the circulation rates during package dyeing, but, generally speaking, the rate is likely to depend on the denier and would be slower with finer deniers. For this reason it may be necessary to have a smaller rate than when dyeing coarse denier.

(2) The arrangement of hanks in an Obermaier cage should be such as to secure an even pack to avoid channelling as much as possible.

(3) The object of adding ammonium sulphate is to lower the pH of the dyebath and avoid alkaline conditions, which are conducive to the reduction of certain direct dyes.

## COMMUNICATIONS

### The Dyeing of Cellulose Acetate with Disperse Dyes VI—Affinities, Heats of Dyeing, and Heats of Solution

C. L. BIRD and Miss P. HARRIS

The partition of disperse dyes between water and cellulose acetate has been studied by means of desorption experiments, and the results have been used to calculate values for affinity, heat of dyeing, and entropy change. Aqueous solubilities have been determined at different temperatures in order to obtain heats of aqueous solution, and values for fibre saturation and heat of solution in the fibre have been calculated.

#### INTRODUCTION

In a previous communication<sup>1</sup> it was shown that many disperse dyes have appreciable aqueous solubility at 80°C. The solubility is, in fact, sufficiently high to enable the distribution of dye between water and cellulose acetate to be studied over a range of temperatures. From such partition experiments it is possible to calculate the standard affinity of the dye, the heat of dyeing, and the entropy change. With one dye, viz. 2-methoxy-4-nitroaniline-*N,N*-bis- $\beta$ -hydroxyethylaniline, we were able to carry out partition experiments over a considerable concentration range at 80°C. It was shown<sup>2</sup> that, at equilibrium, there is a linear relationship between dye on the fibre and dye in the aqueous solution, whether distribution is attained by adsorption or by desorption.

In the work described in this paper we have examined the distribution of a number of purified disperse dyes between water and secondary cellulose acetate. In some cases the study was extended over a range of temperatures; with other dyes desorption experiments have been carried out only at 80°C. The results of the desorption experiments are given in Tables I and II. Standard affinities ( $-\Delta\mu^\circ$ ) were calculated from the equation—

$$-\Delta\mu^\circ = RT \ln \frac{[D]_f}{[D]_s}$$

where  $R$  is the gas constant and  $T$  the absolute temperature;  $[D]_f$  is the concentration of dye in the fibre and  $[D]_s$  the concentration in the aqueous solution, expressed in moles per kilogram of completely dry fibre and moles per litre respectively.

The heat of dyeing ( $\Delta H^\circ_{\text{Dye}}$ ) is obtained from affinity values at different temperatures. Since—

$$\Delta H^\circ_{\text{Dye}} = \frac{d(\Delta\mu^\circ/T)}{d(1/T)}$$

$\Delta H^\circ_{\text{Dye}}$  can be obtained by plotting  $\Delta\mu^\circ/T$  against  $1/T$ , the slope giving  $\Delta H^\circ_{\text{Dye}}$ , provided that a straight-line relationship is obtained, as was found to be the case with all the dyes examined.

The entropy change ( $\Delta S^\circ$ ) is obtained from the equation—

$$\Delta\mu^\circ = \Delta H^\circ - T\Delta S^\circ$$

The values in Table II for solubility in the fibre at 80°C, i.e. the saturation values<sup>3</sup>, have been calculated by multiplying the aqueous solubility by the distribution coefficient ( $K$ ), on the assumption that a linear partition is obtained up to saturation in both phases.

If the above assumption is correct, as appears to be the case, it is possible to obtain the heat of solution of the dye in the fibre from the equation—

$$\Delta H^\circ_{\text{Fibre}} = \Delta H^\circ_{\text{H}_2\text{O}} + \Delta H^\circ_{\text{Dye}}$$

where  $\Delta H^\circ_{\text{Fibre}}$  is the heat of solution in cellulose acetate,  $\Delta H^\circ_{\text{H}_2\text{O}}$  the heat of solution in water, and  $\Delta H^\circ_{\text{Dye}}$  the heat of dyeing. The heat of aqueous solution was obtained by plotting the logarithm of the aqueous solubility against  $1/T$ . The slope of the straight line thus obtained, when multiplied by 2.303  $R$ , gives  $\Delta H^\circ_{\text{H}_2\text{O}}$ , since—

$$\Delta H^\circ_{\text{H}_2\text{O}} = R \frac{d \ln (\text{Solubility})}{d(1/T)}$$

#### EXPERIMENTAL

Purified dyes and oil-free Celanese secondary cellulose acetate yarn were prepared as described previously<sup>1</sup>. Colorimetric estimations on aqueous solutions and dyed yarn were carried out in the usual way with a Hilger Spekler absorptiometer.

The desorption method used was that developed by Gilbert<sup>4</sup> and later modified by Lemkin<sup>5</sup>. A small quantity of dyed yarn (0.5 g.) was placed in a bulb forming part of a U-tube, one end of which was closed with a rubber bung, whilst the other end was connected alternately, by means of a three-way tap mechanically rotated at 27 r.p.m., to a vacuum line and to the atmosphere. The U-tube was half-filled with 10–12 ml. of water, which was brought to the temperature of the

\* Strictly speaking, the terms "apparent solubility in the fibre" and "apparent saturation value" should be used, since the "saturated" fibre is not in contact with solid dye, but only with a saturated aqueous solution *c.f.*

surrounding, thermostatically controlled water-bath before the yarn was added. The operation of the suction-and-release device then caused the water to oscillate backwards and forwards through the yarn. After the water and the dyed yarn had reached equilibrium, the time required depending on the temperature, the first sample of yarn was replaced by a second sample, which quickly came to equilibrium with the desorbed dye solution without any appreciable loss of dye. A 5-ml. sample of the liquor was then removed with a heated pipette and suitably diluted with acetone for colorimetric analysis, whilst the amount of dye on the yarn was determined after dissolving in acetone one 0.5-g. hank from the bulk of dyed and conditioned yarn. Thus, for each series of desorptions, only one estimation of the concentration of dye on the fibre was necessary.

depth of colour in the desorbing liquor, dispersions of the purified dyes, prepared as described in Part III<sup>6</sup>, were used. No additional dispersing agent was added to the dye liquor. The small amount of dispersing agent adsorbed by the yarn was removed by thorough rinsing in hot water: if any remained, it was at once made apparent by frothing of the desorbing liquor.

Solubility determinations were carried out by using crystalline dye and distilled water, in a 100-ml. round-bottomed flask containing a glass-stoppered side-tube. This flask was partly immersed in a thermostatically controlled water-bath, and the contents were agitated vigorously by means of a glass stirrer passing through a cork in the neck of the flask and driven by a small electric motor. After reaching equilibrium in 24–48 hr., samples for colorimetric analysis were

Dye	Affinity (kcal./mole)				Heat of Dyeing (kcal./ mole)	Heat of Soln. in Water (kcal./ mole)	Heat of Soln. in Cellulose Acetate* (kcal./ mole)	Entropy (cal./ mole per °C.)	
	60°C.	70°C.	80°C.	90°C.					
4:4'-Diaminobenzene	...	—4.25	—4.10	—3.91	—3.71	—9.8	14.0	4.2	—16.7
4-Nitro-4'-aminobenzene	...	—5.42	—5.22	—5.07	—4.96	—10.6	15.4	4.8	—15.6
3-Nitro-4'-aminoazobenzene	...	—	—	—4.98	—4.80	—12.0	15.4	3.4	—19.8
4-Nitroaniline→N-ethyl-N-β-hydroxyethylaniline	...	—	—5.55	—5.43	—5.30	—9.8	17.5	7.7	—12.4
4-Nitroaniline→NN-bis-β-hydroxyethylaniline	...	—4.74	—4.57	—4.37	—4.26	—10.3	17.6	7.3	—16.7
2-Methoxy-4-nitroaniline→NN-bis-β-hydroxyethylaniline	...	—4.63	—	—4.25	—4.09	—10.5	14.5	4.0	—17.7
2:6-Dichloro-4-nitroaniline→NN-bis-β-hydroxyethyl-m-toluidine	...	—	—5.70	—5.55	—5.40	—10.6	18.1	7.5	—14.3
2:4-Dinitro-4'-hydroxydiphenylamine	—4.74	—4.56	—4.37	—4.21	—10.5	13.3	2.8	—17.3	
1:4-Diaminoanthraquinone	...	—4.70	—4.62	—4.46	—4.29	—10.4	15.5	5.1	—16.8
1:4-Diamino-2-methoxyanthraquinone	...	—	—5.07	—4.89	—4.73	—10.9	14.3	3.4	—17.0
1-Amino-4-hydroxyanthraquinone	...	—	—4.99	—4.79	—4.63	—11.1	18.4*	7.3	—17.8
1-β-Hydroxyethylaminoanthraquinone	...	—	—4.57	—4.36	—4.17	—11.3	13.5	2.2	—19.6
1:4-Bis-β-hydroxyethylaminoanthraquinone	...	—3.96	—3.80	—3.63	—3.50	—9.2	15.8	6.6	—15.7

\* By difference.

This method was used for the dyes listed in Table I. With most of the other dyes (Table II) a single desorption was carried out at 80°C. on a larger scale. A 25-ml. sample was then taken, which enabled 4-cm. cells to be used in the absorptiometer without excessive dilution.

Dyeings for the desorption experiments were carried out by one of two methods. A little crystalline dye was placed in a small cotton bag, which was then placed in a conical flask containing distilled water at 80°C. A number of 0.5-g. hanks were dyed in the resulting solution to as deep a colour as possible and then rinsed, dried, and conditioned. This method was suitable only for dyes of low affinity and relatively high aqueous solubility. For dyes of medium and high affinity, where it is desirable to have as much dye on the fibre as possible in order to obtain a measurable

withdrawn through the side-tube by means of a heated pipette to which was attached a cotton-wool plug to filter off undissolved dye. Three or four determinations at different temperatures were made in the range 60–90°C. These experiments showed that the values previously obtained<sup>1</sup> for aqueous solubilities at 80°C. were, in general, too low, mainly owing to insufficient agitation in the earlier experiments.

#### DISCUSSION

The values given in Table I can be compared with those obtained by Majury<sup>7</sup> for five model compounds, viz. *p*-nitroaniline, *NN*-dimethyl-*p*-nitroaniline, azobenzene, *p*-aminoazobenzene, and *NN*-dimethyl-*p*-aminoazobenzene. Majury used the term "heat of solution relative to the dye crystal", which is the same as our "heat of solution

Dye	Aq. Solubility at 80°C. (mg./litre)	Heat of Soln. in Water (kcal./mole)	Partition Coefficient at 80°C.	Solubility in Cellulose Acetate at 80°C. (calc.) (g./100 g. dry fibre)
<b>AZO (and NITRODIARYLAMINE)</b>				
4-Nitroaniline → diethylaniline	...	ca. 0.2	—	ca. 12,000
2-Chloro-4-nitroaniline → <i>N</i> -ethyl- <i>N</i> -β-hydroxyethylaniline	...	4.0	16.1	5,500
2:6-Dichloro-4-nitroaniline → <i>N</i> -ethyl- <i>N</i> -β-hydroxyethylaniline	...	7.6	18.3	3,650
4-Nitroaniline → <i>N</i> -ethyl- <i>N</i> -β-hydroxyethylaniline	...	7.7	17.5	2,500
2-Chloro-4-nitroaniline → <i>NN</i> -bis-β-hydroxyethyl- <i>m</i> -toluidine	...	7.9	16.1	2,740
3-Nitro-4'-aminoazobenzene	...	8.4	15.4	1,040
6-Chloro-2:4-dinitroaniline → <i>NN</i> -bis-β-hydroxyethyl- <i>m</i> -toluidine	...	9.4	16.3	2,600
4-Nitro-4'-aminoazobenzene	...	11.4	15.4	1,400
2:4-Dinitroaniline → <i>N</i> -ethyl- <i>N</i> -β-hydroxyethylaniline	...	13.0	15.8	2,720
2:6-Dichloro-4-nitroaniline → <i>NN</i> -bis-β-hydroxyethyl- <i>m</i> -toluidine	...	15.7	18.1	2,520
2:4-Dinitroaniline → <i>NN</i> -bis-β-hydroxyethyl- <i>m</i> -toluidine	...	21.6	16.2	1,570
4-Nitroaniline → 3'-chloro- <i>NN</i> -bis-β-hydroxyethylaniline	...	24.8	15.4	1,560
4-Aminoacetanilide → <i>p</i> -cresol	...	26.1	16.3	1,060
4-Nitroaniline → <i>NN</i> -bis-β-hydroxyethylaniline	...	26.4	17.6	530
1-Amino-4- <i>p</i> -aminophenylazomphthalene	ca. 28	—	3,100	ca. 9
4-Nitroaniline → <i>NN</i> -bis-β-hydroxyethyl- <i>m</i> -toluidine	...	45	15.1	970
2:4-Dinitroaniline → <i>NN</i> -bis-β-hydroxyethylaniline	...	56	14.4	820
2:4-Dinitro-4'-hydroxydiphenylamine	...	125	13.3	510
4:4'-Diaminoazobenzene	...	200	14.0	265
2-Methoxy-4-nitroaniline → <i>NN</i> -bis-β-hydroxyethylaniline	...	230	14.5	430
<b>ANTHRAQUINONOID</b>				
1:4-Bismethylaminooanthraquinone	...	ca. 2	—	2,300
1-Methylaminoanthraquinone	...	6.1	14.3	1,400
1-Amino-2-methylanthraquinone	...	8.3	ca. 15.5	1,200
1-Amino-4-hydroxyanthraquinone	...	11.7	18.4	910
1:4-Diamino-2-methoxyanthraquinone	...	16.0	14.3	1,100
1:4-Diaminoanthraquinone	...	21.7	15.5	560
1-Methylamino-4-β-hydroxyethylaminoanthraquinone	...	30.3	16.7	730
1:4-Bis-β-hydroxyethylaminoanthraquinone	...	36.6	15.8	180
1-β-Hydroxyethylaminoanthraquinone	...	50.5	13.5	500

in the fibre" but of opposite sign. In general, our values for heat of aqueous solution and heat of solution in the fibre are higher than those of Majury, which is to be expected in view of the larger molecular size of our compounds. Our heats of dyeing are similar to those obtained by Majury for his three azo compounds and are fairly constant (10-11 kcal./mole).

Schuler and Remington<sup>8</sup> have given data in graphical form for the partition of 1-amino-4-hydroxyanthraquinone between water and polyethylene terephthalate (Terylene). From their data the following values may be derived:  $\Delta H^\circ_{\text{H}_2\text{O}} = 18.4$  and  $\Delta H^\circ_{\text{dye}} = -14.7$  (11.1), giving  $\Delta H^\circ_{\text{fibre}} = 3.7$  (7.3) kcal./mole. The values in parentheses are those for cellulose acetate taken from Table I.

Recently, Kusunose and Odajima<sup>9</sup> have given heats of dyeing for two disperse dyes on cellulose

acetate, viz. -7.2 kcal./mole for Fenacet Fast Red 2G (*p*-nitroaniline → *NN*-bis-β-hydroxyethyl-*m*-toluidine) and +15.4 kcal./mole for Fenacet Fast Blue FFN (probably 1-methylamino-4-β-hydroxyethylaminoanthraquinone). Equilibrium was reached by adsorption, instead of by desorption as in our experiments. We have found that, especially with anthraquinonoid disperse dyes, true equilibrium is reached extremely slowly when dyeing from a dispersion, apparently owing to the presence of some relatively large, unreactive crystalline particles which dissolve with great difficulty. The rate of dissolution of these particles is increased by raising the temperature, thus giving an apparent increase in partition coefficient with rise in temperature. This phenomenon would account for the positive heat of dyeing obtained by Kusunose and Odajima for Fenacet Fast Blue FFN. We have obtained a heat of dyeing of ca. -11 kcal./mole for

1-methylamino-4- $\beta$ -hydroxyethylaminoanthraquinone.

From Table II, where the dyes are listed in order of their aqueous solubility at 80°C., it is seen that there is some correlation between partition coefficient and aqueous solubility (at 80°C.). In general, the partition coefficient decreases with increasing aqueous solubility, as illustrated in Fig. 1, in which the best straight lines have been drawn through the two sets of points (by the method of least squares). It is probable that the correlation depends to some extent on the fact that rather similar dyes were examined. Thus, when the structure is modified by introducing an additional benzene ring the effect is considerable, as is seen when 1-amino-4-p-aminophenylazo-naphthalene (Dispersol Diazo Black B) (1, Fig. 1) is compared with 4:4'-diaminoazobenzene: the affinity for cellulose acetate is increased to a much greater extent than might have been expected from the drop in aqueous solubility.

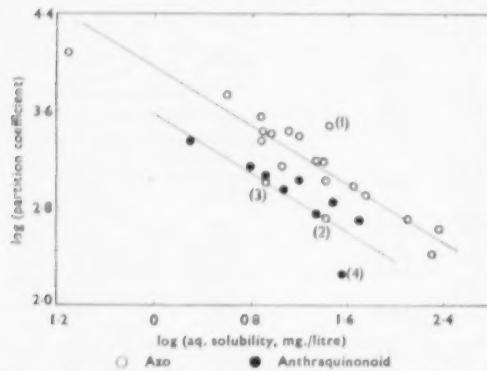


FIG. 1—Relation between Aqueous Solubility and Partition Coefficient at 80°C.

In Part II a correlation was found between aqueous solubility and levelling power. Dispersol Diazo Black B, however, is an exception, since relatively high aqueous solubility is accompanied by only moderate levelling power. This suggests that affinity rather than aqueous solubility is the controlling factor in levelling, but, as shown in Table II, a disperse dye with relatively high aqueous solubility usually has a low value for the partition coefficient.

*p*-Nitroaniline  $\rightarrow$  *NN*-bis- $\beta$ -hydroxyethyl-aniline (Dispersol Fast Red R) (2, Fig. 1) is also

anomalous, as is 3-nitro-4'-aminoazobenzene (3), both showing considerably lower affinity for cellulose acetate than might have been expected from the aqueous solubility.

Among the anthraquinonoid dyes examined only one, 1:4-bis- $\beta$ -hydroxyethylaminoanthraquinone (4), shows exceptional behaviour. The presence of the two terminal hydroxy groups reduces the affinity for cellulose acetate to a marked extent, and in consequence the fibre saturation value is low. In general, the anthraquinonoid members show a lower partition coefficient than azo dyes of similar aqueous solubility, as illustrated in Fig. 1.

Fourness<sup>10</sup> has recently drawn attention to the fact that, on secondary cellulose acetate, 1-methylamino-4- $\beta$ -hydroxyethylaminoanthraquinone builds up much better than either 1:4-bismethylaminoanthraquinone or 1:4-bis- $\beta$ -hydroxyethylaminoanthraquinone. The figures in the last column of Table II suggest that the poor building properties of the two symmetrical dyes are due to their low saturation values.

\* \* \*

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## References

- Bird, J.S.D.C., **70**, 68 (1954).
- Bird, Manchester, and Harris, *Faraday Society Discussion on the Physical Chemistry of Dyeing and Tanning*, (16), 85 (1954).
- Stubbs, J.S.D.C., **70**, 120 (1954).
- Gilbert, *Proc. Roy. Soc., A* **183**, 167 (1944).
- Lemkin, in Vickerstaff's *The Physical Chemistry of Dyeing* (2nd edition 1954. Oliver & Boyd), p. 95.
- Bird, Harris, and Manchester, J.S.D.C., **71**, 139 (1955).
- Majury, *ibid.*, **70**, 442 (1954).
- Schuler and Remington, *Faraday Society Discussion on Dyeing and Tanning*, (16), 201 (1954).
- Kosunono and Odajima, *J. Soc. Textile Cellulose Ind. Japan*, **12**, 418 (1956).
- Fourness, J.S.D.C., **72**, 517 (1956).

## Alginate Hessian

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Alginate hessian suitable for military camouflage use has been fabricated from pigmented continuous-filament yarn using the interlace knitting technique. Resistance to use and weathering was enhanced by chromating the fabric thus obtained and coating with pigmented, chlorinated paraffin wax emulsified in sodium caseinate solution.

During the Second World War an urgent need arose for a substitute for jute hessian used for garnishing camouflage nets. The replacement had, of necessity, to be based on an indigenous raw material, preferably of a type not required for other purposes and capable of being fabricated quickly, as far as possible by means of existing machinery and techniques for spinning, fabricating, and finishing.

Bonniksen<sup>1</sup> had shown that it was possible to produce transparent films by extruding an aqueous solution of sodium alginate into a calcium chloride fixing bath, and it was largely on the basis of this work that it was decided to attempt the production of alginate textile yarns and assess their value in the fabrication of scrim. An investigation to this end was initiated by the Ministry of Home Security in 1942 and completed by the Ministry of Supply, being carried out by research teams of Courtaulds Ltd., Coventry, Sound City (Films) Ltd., Shepperton, the Department of Textile Industries, Leeds University, and the Chemical Research and Development Branch, Ministry of Supply, Leamington Spa, working in collaboration. The work recorded here was that undertaken by the last-named group, using alginate yarns fabricated to their specification by Courtaulds Ltd. The development of a process for the production of the necessary calcium alginate (C.A.) and also the survey of British brown seaweed resources from which the alginates are obtainable are described elsewhere<sup>2,3</sup>.

At the time this investigation started alginate yarn production had been carried out only on an experimental scale and was limited almost entirely to calcium alginate continuous-filament fabrication. Yarns then available had many shortcomings as raw material for scrim production, the principal of which, if considerations of cost, availability, and purity of alginate be discounted, were—

(1) Excessive shrinkage of the fabric on wetting and drying, resulting in pulling, curling, and twisting.

(2) Excessive water uptake, i.e. high water imbibition, resulting in "soggy", lifeless scrim which droops excessively owing to the extra weight the fabric has to carry.

(3) Low dry tensile strength and elasticity, and excessive loss of tensile strength when wet.

(4) Rapid deterioration to a brittle and friable condition on weathering.

These properties lead to serious difficulties in fabrication and cause conventionally produced C.A. garnishing material to be of little value in wet and windy weather. Faults (2) and (3) can probably be entirely eradicated only by chemical alteration of the alginate molecule and removal of

all the impurities usually associated with production raw material. Faults (1) and (4) are probably inherent in this type of fabric and, at best, can probably be reduced only by actual chemical change of the alginate molecule or by controlled preshrinkage and incorporation of suitable bactericides or fungicides.

As it was impossible, under pressure of war-time conditions, to carry out the work necessary to eradicate these faults completely, it was decided to try to overcome them partially at least by using temporary expedients aimed at giving a scrim capable of withstanding exposure and rough usage as well as, or better than, standard hessian scrim.

It was considered that fault (1) could best be overcome by controlled shrinkage of the fabric either by (a) treatment with hot water or (b) partial chromation of the alginate yarn or fabric<sup>4</sup>. These processes would also lower the water imbibition of the fabric, (b) being more efficacious than (a), and it was also believed that process (b) would result in a fabric more resistant to weathering than the fully calcified material, although it was not known whether the process would also reduce the dry tenacity and the wet and dry extensibilities.

It was also considered that the best method of preventing twisting and curling of the scrim after wetting and drying was by the application of a combined stiffening and waterproofing finish.

### DETAILS OF INVESTIGATION

The investigation was planned to cover, as far as possible, all combinations of the most important variables, i.e. type of yarn, method of fabrication, and fabric pre- and after-treatments.

#### *Yarn*

It was considered that C.A. continuous-filament and staple yarns were most likely to give the required results. Previous experience with fine continuous yarns (550 denier—100 filaments) having shown their unsuitability for scrim production, it was decided to use coarser filaments more nearly resembling the jute yarn used in standard hessian scrim. Throughout this investigation 1,100 denier—50 filaments continuous-filament yarn was used, which was pigmented by the addition of 3.5% chrome green and 2.5% yellow iron oxide (dry weight on the sodium alginate) to the dope.

The 12-lb. staple yarns used in this investigation were spun from 40-denier filaments on the jute principle, again to imitate as nearly as possible the yarn used in producing hessian scrim. The work with staple fibre was a later development and

TABLE I  
Scope of Trials

Yarn Continuous-filament or Staple yarn	Fabrication Knitted (2 in. wide) Woven (2 in. wide)	Pretreatment	Aftertreatment
		Chromated	Casein-stiffened
		Not treated	Not stiffened
Woven (48 in. wide)	Chromated Boiled	Casein-stiffened	Afterchromated
		Alginic-stiffened	Afterboiled

limitations of time did not permit all the experimental work to be completed.

#### Fabrication

Conventional weaving and knitting techniques were examined, the simplest and cheapest method known to give a satisfactory product being used in each case. Plain weaving only was used, whilst interlace knitting was used with continuous-filament yarn and straight pillar knitting with staple fibre. The staple fibre available was found to be unsuitable for the interlace method.

The majority of the experimental scrims were woven or knitted to finish 2 in. wide, but when it was found that this width of material was difficult to handle in the stiffening stage, open-width (40 in.) knitting and weaving were resorted to, the fabric being pre- and after-treated at full width, and slit and reeled when finished. In the case of interlock knitted scrim the procedure proved advantageous from many points of view.

#### Fabric Pretreatment

The fabric was treated with hot water (10 min. immersion in 0.1% aq. calcium chloride solution at 90°C.) or the calcium therein was partially replaced by chromium. Speakman's chromation technique<sup>4</sup> was used throughout as the only one then available, although it was known that it was unsuitable for bulk production.

#### Fabric Aftertreatment

Stiffening by means of sodium caseinate and alginic acid was attempted. In order to get quick results the stiffening bath normally used for hessian scrim (a suspension of pigment in an emulsion of chlorinated paraffin wax in aqueous sodium caseinate) was employed throughout, although there was little doubt that, for stiffening and waterproofing pigmented C.A. scrim on the production scale, the pigment and chlorinated paraffin wax could partially or completely be dispensed with.

The alginic stiffening was effected by using a 3.5% sodium alginic pigmented dope on a pad mangle, subsequently insolubilising by immersion in 1% aqueous calcium chloride solution. A variation of this technique was tried with C.A. woven scrim straight from the loom, which was alginic-stiffened and subsequently boiled or chromated.

At the time this work was carried out commercial calcium alginic production was in its infancy, and the raw material from which the C.A. fibres were spun was variable in composition and, by present-day standards, impure. The analytical composition range of the three batches used in the production of the yarn employed in this investigation was as follows—

Calcium alginic	66.9-82.3%
Weed residue	0.3-0.7%
Water-solubles	3.5-4.5%
Nitrogen	0.20-0.27%
SO <sub>3</sub>	1.3%
pH	6.8
Viscosity (1% Na alginic soln.)	21-28 centistokes

There is little doubt that with commercial alginic of current high quality significantly better textiles would be obtained.

The trials were carried out, as far as possible, under full production conditions, and sufficient scrim was obtained to enable the tests outlined below to be made. The scope of the trials is summarised in Table I. About 100 scrims were produced according to this plan and were fabricated to the specifications shown in Table II. These were tested to assess their strength, elasticity and stiffness, water imbibition, shrinkage after wetting, and resistance to fire, micro-organisms, exposure, and rough usage, by the methods outlined in the Appendix.

The results of these tests on the 26 most promising samples are recorded in Tables III-V. In Fig. 1-6

TABLE II  
Specifications of Scrims

C.A. Continuous Filament (1100 denier-50 filaments)			12-lb. C.A. Staple Yarn spun from 40-denier Filaments	
Scrims No.	Woven 2 in. wide ... 2-7	Knitted 2 in. wide 8-14	Woven 2 in. wide 15-22	Woven 48 in. wide 23-26
Warp	20 ends/2 in. doubled	22 ends/1 in. single	9 ends/1 in.	9 ends/1 in.
Weft	21 picks/1 in. doubled (2, 3) 16 picks/1 in. doubled (4-7)	Inlay 2-fold 10 picks/1 in. 2-double thread (8, 9) 1-double thread (10-14)	11 picks/1 in. (15-17) 9 picks/1 in. (18-22)	10 picks/1 in.
Fabrication	Plain weave and cotton selvedge throughout	Interlaced pillars— 18 gauge	Plain weave and cotton selvedge throughout	Plain weave, full width with fast split and cotton selvedges

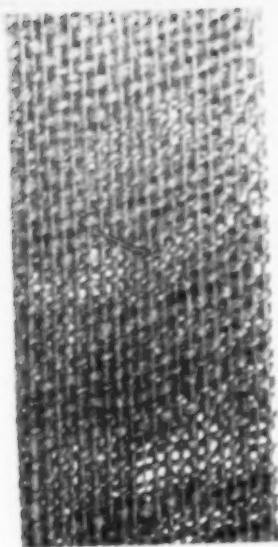


FIG. 1—Standard Jute Hessian Scrim (No. 1)  
before Exposure

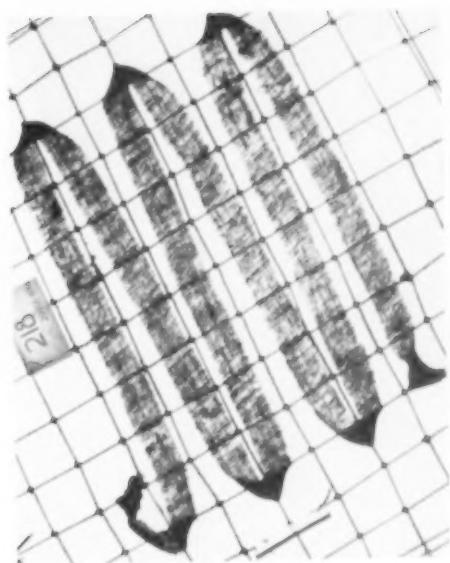


FIG. 4—Standard Jute Hessian Scrim (No. 1) exposed for  
4 months



FIG. 2—Knitted C.A. Continuous-filament Yarn, Cr-  
Cas-stiffened (Scrim No. 10 and 11) before Exposure

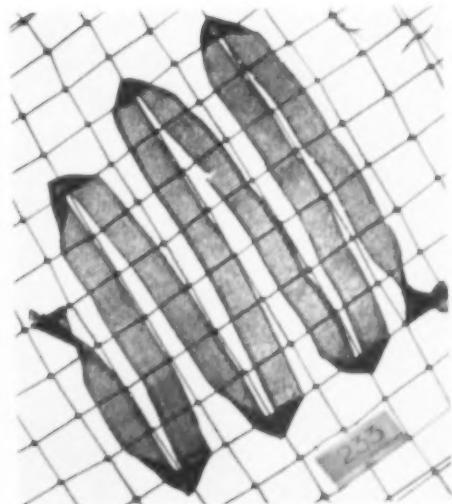


FIG. 5—Knitted C.A. Continuous-filament Yarn, Cr-Cas-  
stiffened (Scrim No. 10 and 11) exposed for 5 months

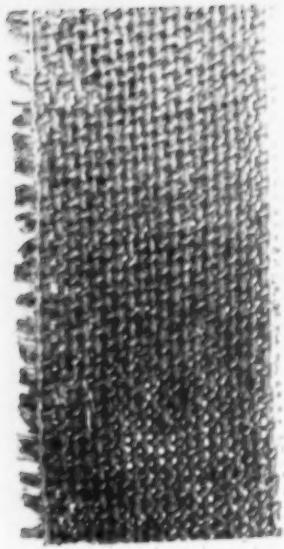


FIG. 3—Woven C.A. Staple Yarn, Cr-Cas.-stiffened (Scrim No. 18) before Exposure

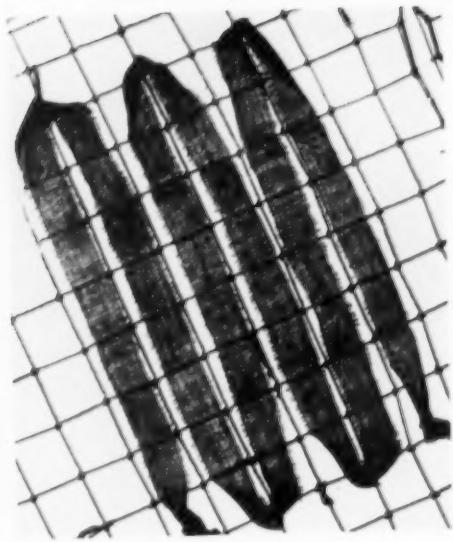


FIG. 6—Woven C.A. Staple Yarn, Cr-Cas.-stiffened (Scrim No. 18) exposed for 4 months

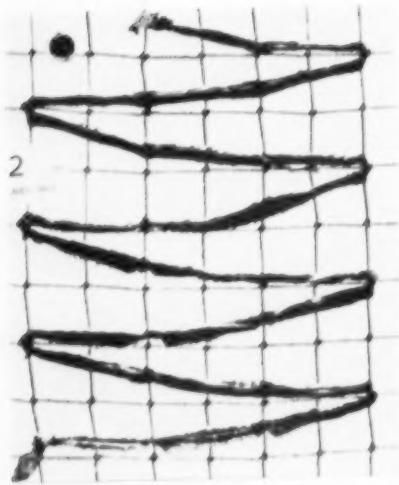


FIG. 7—"Parent" scrim (No. 9), like No. 10 and 11 but unstiffened, exposed for 5 months

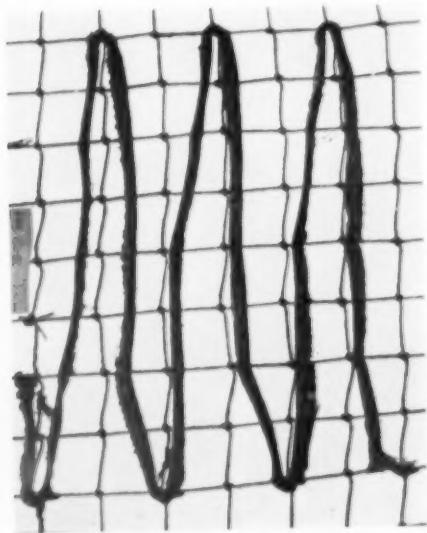


FIG. 8—"Parent" scrim (No. 17), like No. 18 but unstiffened, exposed for 4 months



photographs of standard hessian scrim (1) and the best knitted continuous fibre (11) and woven staple fibre (18) C.A. scrims are appended, together with the three scrims after subjection to "user" and "exposure" tests. Photographs of the "parent" untreated C.A. scrims (9) and (17), after similar treatment, are included for comparison (Fig. 7 and 8).

#### DISCUSSION

From an examination of the test results recorded in Tables III-V the following general conclusions may be drawn—

##### *Shrinkage*

Interlace knitted and plain-woven fabrics made from C.A. continuous yarn of the types used in this investigation shrank appreciably but fairly consistently on wetting. The former method of fabrication appeared to restrict shrinkage more than the latter.

Plain-woven fabrics made from C.A. staple yarn warps and wefts available at the time of this investigation shrank enormously and erratically on wetting.

Coating of an unshrunk C.A. fabric with an insolubilised casein or alginate finish, whilst greatly reducing the rate of shrinkage on subsequent exposure or wetting, did not indefinitely prevent the fabric from shrinking. When preshrunk completely by wetting, chromation, etc. and then stiffened, the fabric did not shrink further on exposure.

##### *Strength and Elasticity*

As is to be expected, C.A. scrims in the main were slightly weaker when dry, and very much weaker when wet, than the comparable jute scrim, although they were more elastic both when wet and when dry.

Chromation, as carried out by us, had the disadvantage that it seriously embrittled the scrim both when wet and when dry, although it bestowed certain desirable properties on the C.A. fabric whilst not seriously affecting the dry or the wet strength.

Finishing of either chromated or unchromated scrim with a coating containing insolubilised casein or alginate did not improve the wet or dry elongation (i.e. the scrim thus treated was still as brittle as before treatment) but materially improved both wet and dry tenacity.

The two stiffening treatments tested appear to be comparable in their effects upon strength and elasticity, although casein appears to be preferable from other points of view. Further work is required to confirm this result, as the casein coating used was plasticised and pigmented, whilst the alginate coating was not.

##### *Water Imbibition*

The problem of reduction of the water uptake of C.A. scrim has been solved, although there is little doubt that further research would bring to light even better methods than those now recorded.

The four main treatments investigated, viz. chromation, casein stiffening, a combination of the

two, and hot-water treatment, have all resulted in substantial reduction, and a finished scrim having a water imbibition of about 60% (hessian scrim = 69%) is now easily obtainable.

Whilst the order of efficiency of the reduction effected by these treatments is—

Chromation + casein > Cassin > Chromation > Boiling with the possible exception of the last they are all sufficiently effective to be considered on the manufacturing scale.

The final choice of method adopted, therefore, depends solely upon the advantages to be gained from other points of view.

##### *Fire-resistance*

All C.A. scrims are vastly superior to hessian scrim from this point of view.

##### *Resistance to Microbiological Attack*

The C.A. scrims produced were found to be in no way inferior to standard hessian scrim when left in damp soil under standard conditions.

##### *Stiffness*

Of the stiffening agents examined, plasticised, pigmented, and insolubilised casein is to be preferred. It produces stiffer scrim than alginate, has satisfactory properties in general, including a low water uptake, and appears adequately to withstand exposure for at least five months. It is fairly certain that further work on alternative methods of stiffening, i.e. examination of the effect of variation in pigmentation and plasticisation of casein or alginate coatings, would eradicate the shortcomings of the present finish, although it is debatable whether comparable stiffening power could be obtained by using economical quantities of alginate.

##### *User Test*

The above facts having been established, it was next necessary to examine each individual scrim after a fourteen days' "user cycle" and after several months' exposure on a grillage. After grill exposure the condition of the scrims was assessed by three independent observers under four headings—(i) retention of form of the original 180° turn in the net, (ii) extent of fraying, (iii) whether "roped" or not, and (iv) whether the scrim had "drooped" or not. The assessments made on this basis are recorded in Tables III-V, and it should be noted that we have taken as the basis in this case, not standard hessian (No. 1), but the "ideal" scrim, which maintains its turn and neither frays, ropes, nor droops. In this test, which is the most important, standard hessian scrim did not show up well, and only three types showed any promise.

##### *Continuous-filament Yarns*

These include knitted scrims (No. 10-12) and interlace knitted continuous C.A. filament, the fabric being afterchromated and casein-stiffened. This type of scrim appears to be the best produced during the investigation. The ease of production demonstrated during the manufacture of two further trial lengths of this type, of 450 yd. each

(No. 12), confirms the earlier findings based on the production of the experimental lengths (No. 10 and 11).

None of the woven scrims in this category prepared in this investigation was found to be completely satisfactory. Fabric of this general type was, however, subsequently produced by the Department of Textile Industries, Leeds University, and by Sound City (Films) Ltd., Shepperton, in collaboration with the authors, and appeared to be satisfactory, although their trials were discontinued before complete user and grill exposure tests could be completed.

#### Staple Yarn

Woven scrims (No. 18 and 19), plain weave, C.A. staple yarn, the fabric afterchromated and casein-stiffened, appear, apart from difficulties during production due to excessive shrinkage, to be satisfactory from the user's point of view.

#### CONCLUSIONS

The best results were obtained by fabrication from pigmented, continuous-filament yarn, the fabric thus obtained being chromated and coated with a suspension of the appropriate pigments in emulsified, chlorinated paraffin wax in aqueous sodium caseinate as normally employed in finishing hessian scrim. Interlace knitted scrim of this type (No. 10) has been shown satisfactorily to withstand winter weathering for five months.

TABLE VI  
Physical Properties of Scrim No. 10 and  
Standard Hessian

	Scrim No. 10	Hessian (No. 1)
Conditioned weight, oz./sq.yd.	13.9	10.8
Tenacity, lb./in.		
Dry ...	30-40	60
Wet ...	10-14	60
Elongation, %		
Dry ...	9-13	5
Wet ...	ca. 10	4
Loss on wetting and drying, %		
Length	1	ca. 1
Width	0	0
Weight	3	ca. 1.5
Water imbibition, %	60	ca. 70

Faults (1), (2), and (4) detailed on p. 203 have been overcome, and sufficient improvement in tensile strength and elasticity (fault (3)) has been effected to enable the fabric to withstand more than the stipulated amount of exposure and rough usage. The physical characteristics of scrim No. 10 are compared with those of standard hessian (No. 1) in Table VI.

\* \* \*

This investigation was carried out during 1943 at the Ministry of Supply Research Establishment, Leamington Spa. Acknowledgment is made to the Chief Scientist of the Ministry for permission to publish and to Mr. Hegan and Mr. Givens of Courtaulds Ltd. for placing their expert knowledge

at our disposal, to Mr. N. Louden of Sound City (Films) Ltd. and Dr. N. H. Chamberlain of Leeds University for their active collaboration and constructive criticism, and to Mr. F. T. Walker, who acted in a liaison capacity.

In addition, we have to thank the directors of the following firms for undertaking much of the experimental production required during the course of this investigation—Baxter Bros. & Co. Ltd., Dundee; Black Bros. Ltd., Jersey Fabrics Ltd., and J. Henry Smith & Co., Nottingham; Courtaulds Ltd., Coventry; Morton Sundour Fabrics Ltd., Carlisle; Simpson & Godlee Ltd., Swinton; Jas. Williamson & Son Ltd., Lancaster; and Thos. Witten & Co. Ltd., Appley Bridge.

#### Appendix

##### FABRIC TESTS

###### Strength and Extensional Break

Measurements were made on dry (conditioned for 48 hr. at 65% R.H. and 21°C.) and wet (1 hr. soaking in distilled water at 20°C.) scrims using a Goodbrand horizontal cloth-testing machine.

###### Wetting-and-drying Test

A 60-in. length of scrim was conditioned, and its length, average width, and weight were determined. It was then loosely threaded in a standard sisal camouflage net stretched on a 30-in. square wooden frame and whilst in a horizontal position evenly sprayed with 2 gal. of rain water from a height of 3 ft. The scrim, still in the net, was dried at room temperature. The cycle of wetting and drying was carried out six times in all; after the final drying the scrim was removed and reconditioned for 24 hr., and the length, weight, and average width were redetermined.

###### Kneading Test

A 10-in. strip was wetted with distilled water and vigorously kneaded continuously in the hands for 5 min. into a ball, with rewetting at intervals to keep the scrim saturated. The strip was then gently straightened out without removing creases or cockles and laid on filter paper to dry at room temperature. The length and the width of the strip were measured before and after the test, and its condition (texture, "rat-tailing", and creasing) was observed.

###### Fireproof Test

A 2-ft. length of the conditioned scrim was placed on a wire former of 12 in. diameter, the fixed end being at the top and the free end hanging vertically from the former on which the scrim lay. A brass ignition cup (1/2 in. external diameter, 1/2 in. high, and 1/8 in. thick) was placed centrally under the scrim exactly 1 in. immediately below the point at which the freely hanging straight portion joined the curved length. Absolute alcohol (0.3 c.c.) was pipetted into the cup and ignited. The time was measured from the moment when the alcohol flame died down until any remaining flame died down and all glow of the charred scrim ceased. The distance charring or scorching had travelled along the strip was also observed.

*Water Imbibition*

A 5-g. conditioned sample was weighed and given three washes, each with 300 c.c. of boiled distilled water at 20°C. for 30 min.; it was allowed to drain for 5 min. between each wash. Surplus water was then removed by lightly mangling between several layers of filter paper until no moisture mark was left on the paper. The sample was reweighed as rapidly as possible in a closed container.

*Stiffness*

The apparatus consisted of a horizontal wooden clamp which held the sample and a vertical card marked in angular degrees. A 10-in. length of scrim was clamped 8 in. from one end and the free end allowed to fall across the face of the card in a controlled atmosphere of 65% R.H. at 21°C. The angle from the vertical was measured to the nearest 5°. The scrim was then reversed to compensate for "set", and the average of the two readings taken. Six samples were tested and the average value was recorded.

## USER TESTS

*User Cycle*

Two 5-yd. lengths of the scrim to be tested were threaded into a 3-in. sisal camouflage net, as shown in Fig. 4-8, and the net was dragged over a frame, simulating a lorry hood, and submitted to the following 48-hr. cycle—

## FIRST DAY

- (1) Thoroughly wetted out with a stirrup pump
- (2) Net dragged off, rolled up, and left for 6 hr.
- (3) Net unrolled and dragged over the frame.

## SECOND DAY

- (1) Net dragged off the frame (dry), rolled up, and left for 6 hr.
- (2) Net unrolled and dragged over frame.

This procedure was followed six times in all, covering a period of 14 days, and the scrim was then examined for fraying and tendency to "rope".

One of the 5-yd. lengths was used for the "Grill Test" (below). On the other, the width, stiffness, and dry and wet strengths and extensibilities were determined.

*Grill Test*

One of the 5-yd. lengths of scrim which had been used for the "User Test" was threaded into a standard 3-in. sisal camouflage net supported horizontally 6 ft. from the ground on a 3-ft. wire grillage, and left exposed to the weather. At intervals of 1 month the general condition of the sample was noted, with particular reference to fraying, shrinkage, and tendency to "rope".

*Flog and Fray Tests*

The apparatus used consisted of a wooden drum 15 in. in diameter and 6 ft. long, driven at 130 r.p.m. A clamp was provided for attaching the test pieces of scrim to the surface of the drum, and a board 9 in. wide was fixed radially to the drum with its top edge 6 in. from the drum surface. The two free ends of a 4-ft. length of the scrim were attached to the drum by means of the clamp so as to form a loop approx. 2 ft. long. The drum was then run for 20 min. The time was noted at which the loop was completely broken through if this had occurred within the 20 min. Three lengths of each scrim were tested together with a length of standard hessian scrim.

## INSTITUTE OF SEAWEED RESEARCH

INVERESK  
MIDLOTHIAN  
SCOTLAND

(Received 13th November 1956)

## References

- <sup>1</sup> Cefoil Ltd. and Bonnicksen, C. W., *BP* 415,042, 492,264.
- <sup>2</sup> Bashford, L. A., Thomas, R. S., and Woodward, F. N., *J. Soc. Chem. Ind.*, **69**, 337 (1950).
- <sup>3</sup> Walker, F. T., *J. Conseil Int. Explor. Mer.*, **20**, (2), 160 (1954).
- <sup>4</sup> Dudgeon, M. J., Thomas, R. S., and Woodward, F. N., *J.S.D.C.*, **70**, 230 (1954).

## CORRESPONDENCE

*The Editor does not hold himself responsible for opinions expressed by correspondents*

## Kinetics of Wool Chlorination

During a preliminary investigation of the reaction kinetics of wool chlorination, following the experimental procedure of Alexander, Gough, and Hudson<sup>1,2</sup>, it was noticed that a vortex was formed in the space enclosed by the wool fabric. The depth of the vortex increased with increase in stirrer speed and, at speeds above 300 r.p.m., the top edge of the fabric was not submerged in the liquid at all and it also appeared that the inside of the fabric was mostly out of contact with the liquid.

This observation was tested in greater detail in a replica of Alexander, Gough, and Hudson's apparatus at different stirrer speeds, the speed being checked in each experiment by means of a stroboflash torch, by the following methods—

(a) Photographing the fabrics with the aid of an electronic flash (Fig. 1 and 2).

(b) Treating samples with 2% available chlorine on the weight of the wool at pH 2 in a liquor: wool ratio of 150:1 for 2 min. and, after rinsing, "antichloring" and rinsing, staining with Kiton Red G (CDC) (C.I. Acid Red 1) (10 g./litre) at room temperature for 30 min., and rinsing with water.

(c) Treating samples with 2% potassium permanganate on the weight of the wool in a liquor: wool ratio of 150:1 for 2 min. at room temperature, and then rinsing with water (Fig. 3).

It seemed evident that at stirrer speeds above 300 r.p.m. uneven treatment occurred owing to vortex formation and also owing to sucking of air into the solutions.



FIG. 1—300 r.p.m.



FIG. 2—400 r.p.m.

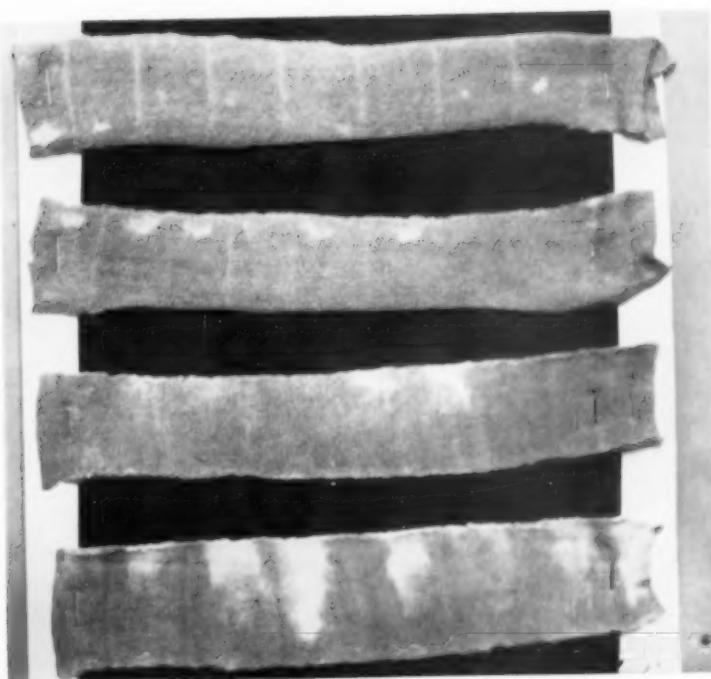
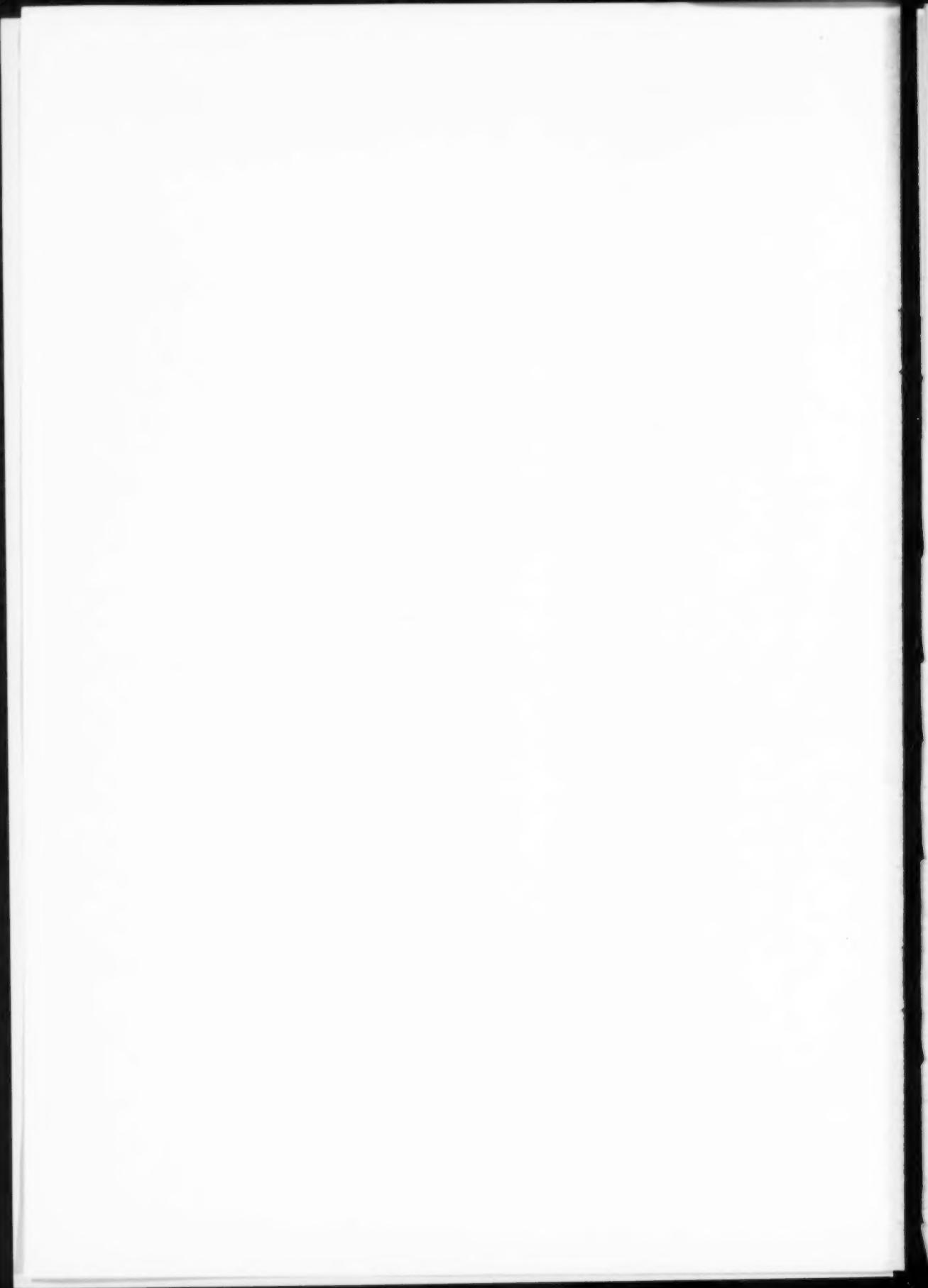


FIG. 3



It is suggested that this phenomenon may have been overlooked by Alexander, Gough, and Hudson in their work and that it may have some bearing on the change in kinetics observed by these workers at stirrer speeds between 300 and 400 r.p.m.

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22nd March 1957

<sup>1</sup> Alexander, P., Gough, D., and Hudson, R. F., *Trans. Faraday Soc.*, **45**, 1058 (1949).

<sup>2</sup> Alexander, P., *J.S.D.C.*, **66**, 349 (1950).

## Notes

### Meetings of Council and Committees April

Council—No meeting

Publications—16th

*Colour Index* Editorial Panel—15th and 30th

Examinations Board—17th

### Death

We regret to report the loss by death of Dr. J. A. Lichtenstein.

### Invitation to Authors

It is said that every man is capable of writing one book—based on his own life. Certainly most members of our Society could write a paper dealing with some aspect of colouring or dyemaking.

Research workers can be relied upon to seek publication of their work, but to dyers and colourists concerned with day-to-day processing the idea of publishing a paper or delivering a lecture is usually quite foreign.

From time to time an Honorary Secretary has managed to persuade a member of his Section to give a "practical" paper in the form of a lecture which has subsequently been published in the *Journal*. Such papers have been well received at the time and have continued to be of use, especially to students and their teachers.

Thanks to the initiative of the Midlands Section, it has been possible to start a new scheme aimed at filling the need for up-to-date information about standard dyeing procedures. The first contribution is a short monograph on the dyeing of half-hose, which will be available in the near future. The Publications Committee hopes that other Section Committees will be able to persuade some of their members to write short monographs on branches of dyeing and finishing, so that the series can be continued. The difficulties are fully appreciated: there is always the fear of giving away the secrets of a particular firm, but what the student or apprentice requires is a guide to general practice, i.e. the procedure in general use in a particular branch of the industry.

The Publications Committee seeks the assistance of members who are prepared to help. This help could take the form of a paper which might be suitable for delivery as a lecture in the first instance. Alternatively, it might be more suitable for publication as a communication or a short monograph. If the paper deals with some highly

specialised branch of the industry it might conceivably be quite short, but would be welcome none the less. Prospective authors can count on advice from the Publications Committee and help from the Editor. Given the necessary practical knowledge, neither youth nor lack of experience of writing need stand in the way of an author's submitting a paper for consideration by the Publications Committee.

### Composition of the *Journal* since the War

Honorary Secretaries of Sections have expressed the view that the number of lectures published in the *Journal* is tending to decline. Investigation has shown that, as is seen in Table I, considerably fewer lectures were published in 1956 than in 1955. The Publications Committee is now taking steps to increase the number of lectures published, in particular by sparing no effort to obtain manuscripts from lecturers. In some cases, e.g. where a lecturer has covered familiar ground, the paper will be published as an abridged version.

During the course of this investigation, data were compiled which show the composition of the *Journal* since the 1939–1945 war. At the request of Council this information (Tables I–III) is now published, since it is of interest to readers of the *Journal* and is worth placing on record.

TABLE I  
Papers published 1946–1956

Year	Lectures	Communications	F.T.C.C. Papers	Explanatory Papers	Symposium Papers	Total
1938	24	13	1	1	—	37
1946	20	23	—	—	(29)*	72
1947	22	13	—	—	17	52
1948	15	15	—	—	—	30
1949	18	17	—	—	25	60
1950	28	20	—	—	—	48
1951	9	21	4	—	16	50
1952	14	16	5	—	—	35
1953	18	16	3	—	18	55
1954	21	19	2	—	—	42
1955	20	18	2	4	13	57
1956	12	17	5	1	—	35

\* N.B.—The 1946 Symposium was published as a separate volume.

TABLE II  
Comparison of the *Journal* for 1955 and 1956

	No. of Pages	Per cent of Total	
		1955	1956
Official Notices ...	11	11	1.4 1.8
A.G.M. and Dinner ...	14	12	1.8 1.9
A.S.D.C. Examination ...	14	13	1.8 2.1
Lectures ...	156	97	20.6 15.6
Communications ...	146	125	19.2 20.0
F.T.C.C. Papers ...	64	30	8.4 4.8
Explanatory Papers ...	40	8	5.3 1.3
Book Reviews ...	34	20	4.5 3.2
Notes, Obituaries, etc. ...	37	40	4.9 6.4
Pattern Cards ...	8	10	1.1 1.6
Abstracts ...	236	258	31.0 41.3
Total ...	760	624	100.0 100.0
Symposium Papers...	158	—	—

TABLE III  
Abstracts Section

Year	Pages of Abstracts	Total Pages*†	Per cent of Total*
1938	(178)	(594)	(30)
1946	84	(392)	(21)
1947	89	(364)	(24)
1948	171	(420)	(41)
1949	245	584	42
1950	219	667	33
1951	190	488	39
1952	227	544	42
1953	197	524	38
1954	225	600	38
1955	236	760	31
1956	258	624	41

\* The figures for "total pages" and "% of total" for 1938 and 1946-1948 cannot be compared with the figures for 1949-1956, owing to alterations in the size of type used. The type used in the Abstracts Section has been the same since 1946.

† The "total pages" exclude symposium papers.

The position with regard to abstracts deserves special consideration. At the end of 1947 it was still affected by the war, and the number of patents and papers suitable for abstracting was smaller than before the war. For example, there were no longer large numbers of I.G. patents. By 1949 the number of pages of abstracts had nearly trebled, owing to the following causes—

- (1) Recovery from wartime conditions
- (2) Abstracting of United States patent specifications
- (3) A much wider coverage.

The position is illustrated by the figures in Table IV.

TABLE IV  
Abstracts of Patents

Year	BP	USP	Total
1938	1,031	—	1,031
1947	415	—	415
1955	940	607	1,547

As seen in Table III, in 1938 the Abstracts Section accounted for 30% of the *Journal*. In 1955 the figure was 41%, but, allowing for the smaller type now used in the Abstracts Section, the figure

would be 53% if based on the actual number of words. Hence the proportion of abstracts in the *Journal* is greater than before the war and now exceeds 50% of the total words printed in the *Journal*. This is not surprising in view of the ever increasing volume of research, and the size of the Abstracts Section would be even greater if it were not for the Publications Committee's policy of making abstracts as brief as possible (11-12 per page). This policy is reflected in the large size of the annual index of the *Journal*. Table III also shows that the size of the Abstracts Section is tending to increase, a tendency which is reflected in other scientific and technical journals.

#### Insignia Awards in Technology (C.G.I.A.) Fred Scholefield and Edgar Isles

In addition to the normal Insignia Awards (see J.S.D.C., 69, 25 (1953)), the Council of the City and Guilds of London Institute makes special awards up to a maximum of five (one in each of the broad industrial groups—chemical, constructional, electrical, mechanical, and textile) to selected persons of outstanding technological achievement, whose example is an indication to candidates of the possibilities of accomplishment and success.

Among four such awards made this year, two have been conferred on Fellows of our Society. Mr. Scholefield (chemical industries—manufacture of dyes) is a Past President and an Honorary Member of the Society. He obtained his City and Guilds certificates and medals during 1904-1906, and in 1951 retired from the post of Head of the Department of Textile Chemistry of the Manchester College of Technology, when he was appointed Technical Adviser to the Dyestuffs Office of the Board of Trade. Mr. Isles (textile industries—textile dyeing) obtained his first City and Guilds awards during 1916-1917; he is now chairman of the executive board of directors of the British Cotton and Wool Dyers' Association Ltd., and is also a Liveryman of the Worshipful Company of Dyers.

#### Mayor of Batley

A member of the West Riding Section of the Society, Councillor H. I. Sykes, is to be the next Mayor of Batley.

#### Centenary of Perkin's Works

The Borough of Ealing is to erect a plaque on one of the buildings belonging to Durasteel Ltd. in Oldfield Lane, Greenford Green, to commemorate the opening in 1857 on that site of the dyemaking factory of Perkin & Sons.

#### Association of Piece Dyers Ltd.

The Association of Piece Dyers has been registered as a company limited by guarantee, having the objects of promoting export trade and research, and providing specifications for the dyeing and finishing of cotton and cotton-mixture cloths,

trade marks indicating goods dyed to such specifications, and services to enable members to achieve high standards efficiently and economically, e.g. by establishing a uniform costing system.

### The Institution of Chemical Engineers

Approval has been given to the grant of a Royal Charter to the Institution.

### The University of Leicester

The University College of Leicester is to acquire full university status. It will thus be the fifth new university to be founded in England since the end of the Second World War, the others being at Exeter, Hull, Nottingham, and Southampton. Another postwar degree-giving institution is the University College of North Staffordshire, founded at Keele in 1949.

### Legislation on Food Dyes

According to *Chemistry and Industry* (380, 30th March 1957) regulations concerning the colouring of food made by the following governments are abstracted in No. 6 and 7 of *Current Food Additives Legislation* (published by the F.A.O. in Rome—see J.S.D.C., 72, 538 (1956); 73, 166 (April 1957)): Canada (Quebec) (prohibition of the addition of colouring substances to any product imitating butter, not including margarine), Denmark, Finland, France (fruit and vegetables, foodstuffs and beverages), Norway (list of approved colouring matters, vegetable preserves), Spain (meat products and cold meats), and Sweden (correction to list of food dyes).

### Review of Textile Progress

The Joint Committee of the Textile Institute and the Society responsible for the preparation of the *Review of Textile Progress* wishes to draw attention to the position regarding early volumes. A very few copies of Volume I are still available, but Volumes II and III are out of print and the type for these has been distributed. A few copies of Volumes IV–VI are still available. Owing to increased cost of storage of type the Committee has recommended that this should be held only for a limited period, and reprints are unlikely unless there is a very considerable demand.

The complete set to date (Volumes I–VII) covers the years from 1949 to 1955 inclusive (Volume VIII for 1956 is in preparation), and thus forms a comprehensive record of postwar developments in textiles. Each volume is fully indexed. As time goes on it will become increasingly difficult to procure these early volumes, so that those who wish to complete their sets are strongly urged to place orders without delay for volumes still in print.

### British Celanese Ltd. and Courtaulds Ltd.

Plans have been made for the merger of these two large British producers of man-made fibres, which will bring under a single control assets valued

at more than £161,000,000. Courtaulds Ltd. has grown from a silk firm founded in 1825, and began the production of viscose rayon in 1904 at Coventry. It operates subsidiaries in other countries, notably the U.S.A. and Germany, and its nominal share capital is over £56,000,000. British Celanese Ltd. dates from the end of the First World War, and has been concerned with the manufacture of cellulose acetate for textile and other purposes. Its nominal capital is over £15,000,000. Both firms are interested in other man-made fibres, and recently announced the production of cellulose triacetate.

### Symposia on Macromolecular Chemistry and on Hydrogen Bonding

The symposium on macromolecular chemistry, to be held in Prague during 9–15th September 1957, will consist of two main sections—(a) physics and physical chemistry of macromolecular products and (b) polyreactions. It is being organised under the aegis of the International Union of Pure and Applied Chemistry. Further information is obtainable from the Organising Committee, I.U.P.A.C. Symposium, Technicka 5, Prague 6, Czechoslovakia.

The symposium on hydrogen bonding will be held in Ljubljana (Yugoslavia) during 29th July–2nd August 1957.

### Start of Dye and Pigment Manufacture in Yugoslavia

Production for the first time in Yugoslavia of organic pigments and dyes has commenced at the Chromas, Pliva, and Katran chemical works.

### "Superfinished" (Hochveredelt) Quality Label for Cottons in Germany

Poplins, sateens, and printed and fancy woven goods may now carry the above quality-controlled stamp, already applied to viscose rayon staple since 1952.

### Changes in German Patent Procedure

Beginning on 1st January 1957 German patent specifications (*Patentschriften*) bear the same numbers (from 1,000,001) as the corresponding provisional patents (*Auslegeschriften*), but will indicate whether they differ from the latter. A register of patent applications is to be started, and the prices of both provisional and final patents will be made uniform at DM 1.30. Further information is obtainable from the Deutsche Patentamt, Dienststelle Berlin, Berlin SW 61, Gitschnerstrasse 97–103, Germany.

### German Institute for Hat Research

The Forschungsinstitut für die Hutindustrie, under the direction of Dr. H. G. Fröhlich, has moved from Wiesbaden to Mönchen-Gladbach. It is thus able to make use of the laboratories and other facilities of the textile engineering school and the textile testing station.

## OBITUARY NOTICE

**Harold Jowett**

By the death of Harold Jowett at the age of 59 the West Riding Section of the Society has lost one of its well known figures, and a wide circle of friends will miss his cheerful personality. He died in the Brotherton Wing of the Leeds Infirmary on 27th January 1957 after a very short illness.

Mr. Jowett received his technical education in the Department of Colour Chemistry and Dyeing of the University of Leeds.

After serving in the First World War with the special gas section of the Royal Engineers he joined L. B. Holliday & Co. and for a few years acted as their Midlands representative. For seven years up to 1935 he was employed by Brotherton & Co. Ltd. as chief dye chemist at their Bromborough Works, Cheshire. Subsequently he has acted as an agent for dyeing and finishing machinery, travelling extensively throughout Europe.

Joining the Society in 1914, he maintained throughout the years a very keen interest in all its activities, and in January 1944 gave a lecture entitled *Stripping of Dyed Woollens and other Textile Materials* before a large and appreciative gathering of the West Riding Section.

In 1953 he was made a Liveryman of the Worshipful Company of Dyers and a Freeman of the City of London.

During the 1939-1945 war he held a commission in the Home Guard.

Rugby Union football was his favourite sport, and he was an enthusiastic member of the Morley and Headingley clubs. In his younger days he was an outstanding Badminton player.

He leaves a widow, to whom we offer our deep and sincere condolences.

H. WILES

## New Books and Publications

**Progrès réalisés dans le domaine de la Technologie chimique des Textiles****Première Partie****Progrès réalisés dans l'Application des Matières Colorantes****Les produits auxiliaires dans l'Industrie textile****Volume III**

By Louis Diserens. Pp. xi + 619. Paris: Éditions Teintex 1956. Price, 4,700 francs (in France) or 5,200 francs (abroad).

This is a new edition, in French, of Chapters VI-VIII of *Die neuesten Fortschritte in der Anwendung der Farbstoffe*, which appeared in 1949 and was reviewed in this *Journal* (65, 362 (1949)). These three chapters, dealing with direct dyes, basic dyes, and Aniline Black, including other oxidation dyes, have been translated, rewritten, and greatly expanded, with the result that the book is much more complete in every way. The greatly improved index adds considerably to the value of the book.

Chapter VI (401 pages), dealing with direct dyes, is nearly four times as long as in the 1949 edition and goes more deeply into the chemistry of direct dyes and methods of improving the fastness properties to water, washing, and light.

Chapter VII (62 pages) is concerned with basic dyes, and includes various methods for their fixation and for improving their fastness properties. Some useful data on solvents for basic dyes are followed by methods of printing and the preparation of resist effects.

Chapter VIII (127 instead of 95 pages in the earlier edition) deals with Aniline Black and other dyes obtained by the oxidation of intermediate compounds on the fibre.

This edition has been brought up to date with many additional dye constitutions, to which

references are given, including many to Venkataraman's book as well as to more recent patents. Data on auxiliary compounds, always a feature of the Diserens books, have been greatly amplified, and much longer lists of equivalent products included.

The type is easier to read than that of the earlier Swiss edition, and the book will be welcomed, in particular, by readers who can follow French more easily than German.

It is to be hoped that a successor to Dr. Diserens will be prepared to take over the task of keeping this series of most valuable books up to date.

A. THOMSON

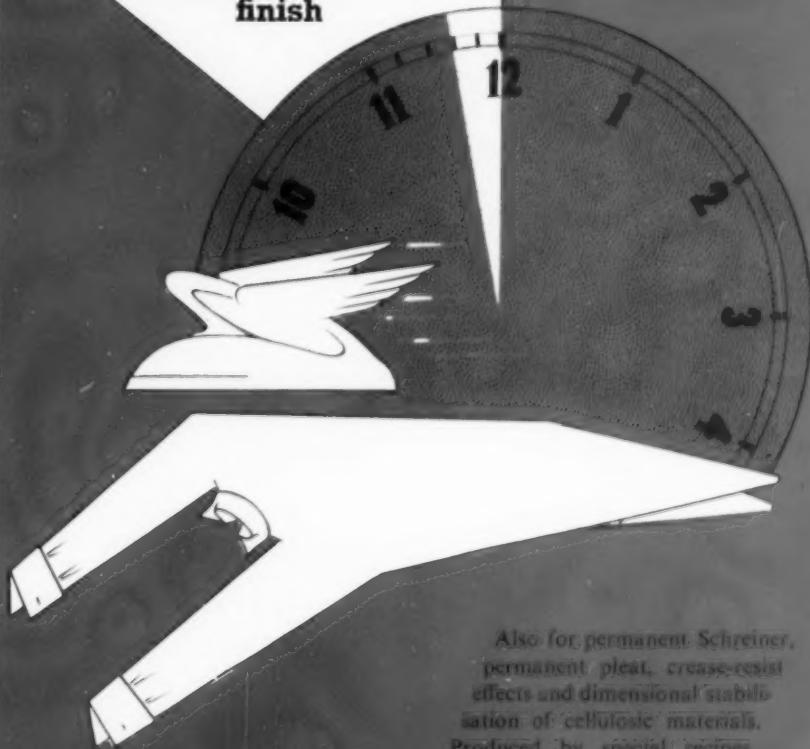
**A Handbook of Textile Finishing**

By A. J. Hall. 2nd edition 1957. Pp. vii + 250. London: The National Trade Press Ltd. Price, 25s. Od.

This second edition differs very little from the first. The author has merely added a few new items, e.g. paragraphs on cellulose triacetate, silicone proofing, cyanoethylation, and tetrakishydroxymethylphosphonium chloride antiflame finishing, and has replaced a number of plates showing finishing machinery by more up-to-date versions. The author, unfortunately, does not live up to his self-proclaimed accuracy. There are several errors in the chemistry: on p. 181 two of the three formulae for hydroxymethylated melamine are incorrect; reference to "melamine-urea" resins on p. 209 should be to *melamine-formaldehyde* resins; a quinquevalent carbon appears on p. 242; and apparently secondary cellulose acetate contains more combined acetic acid than the triacetate (p. 237)! "Sulphonation" of castor oil would be better described as *sulphation* (p. 162). A description of the Erifon process on p. 241 is complete nonsense.

# Finish EN

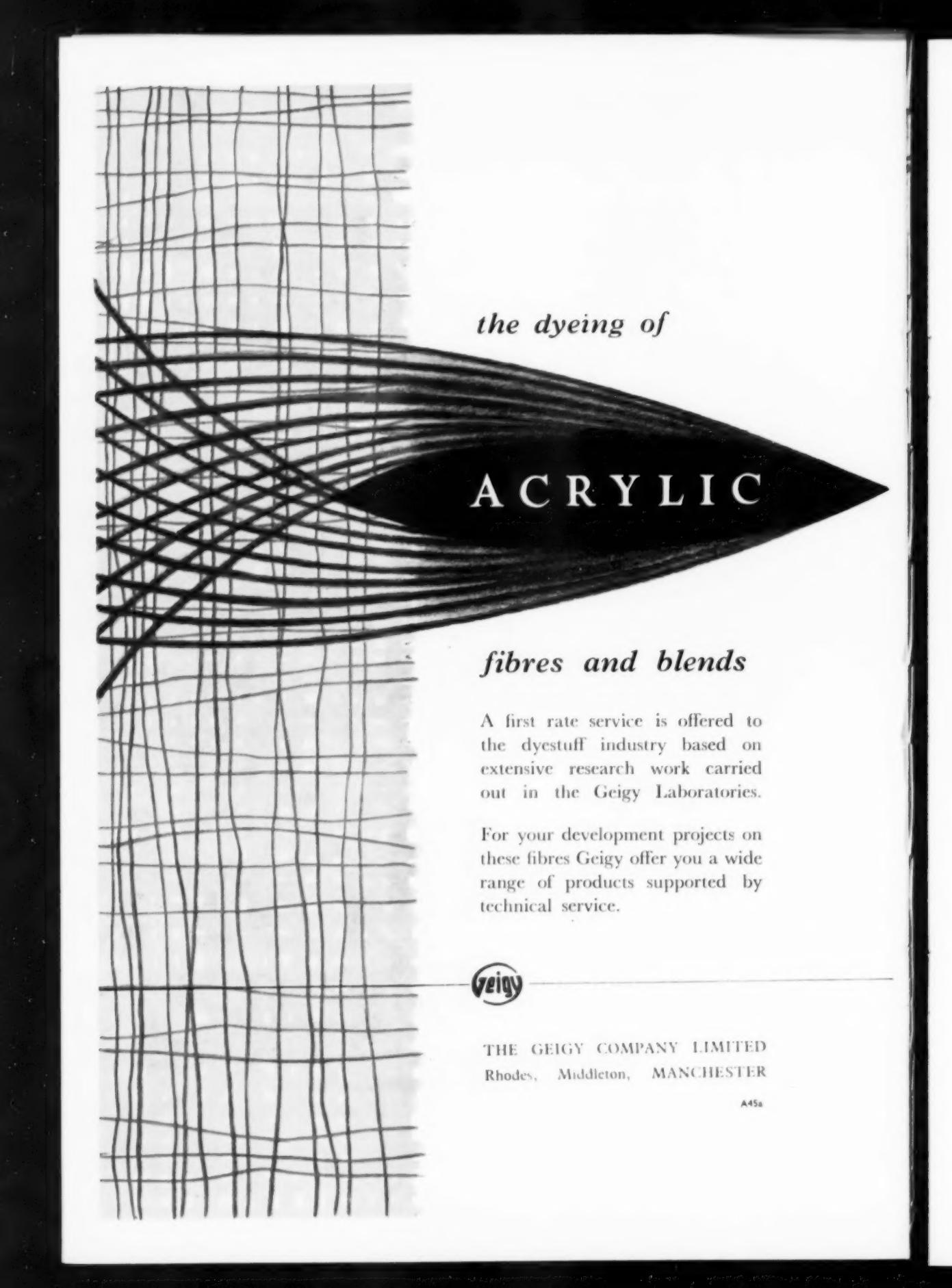
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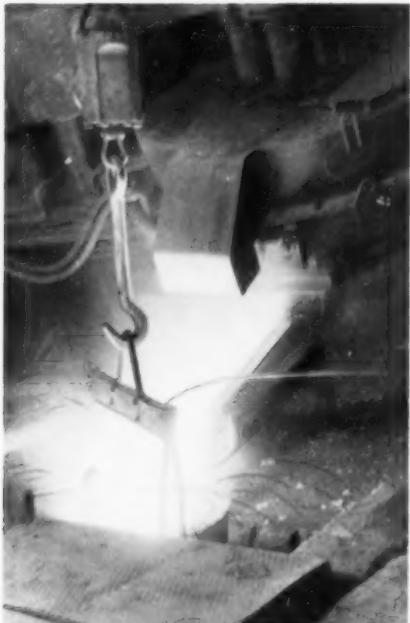
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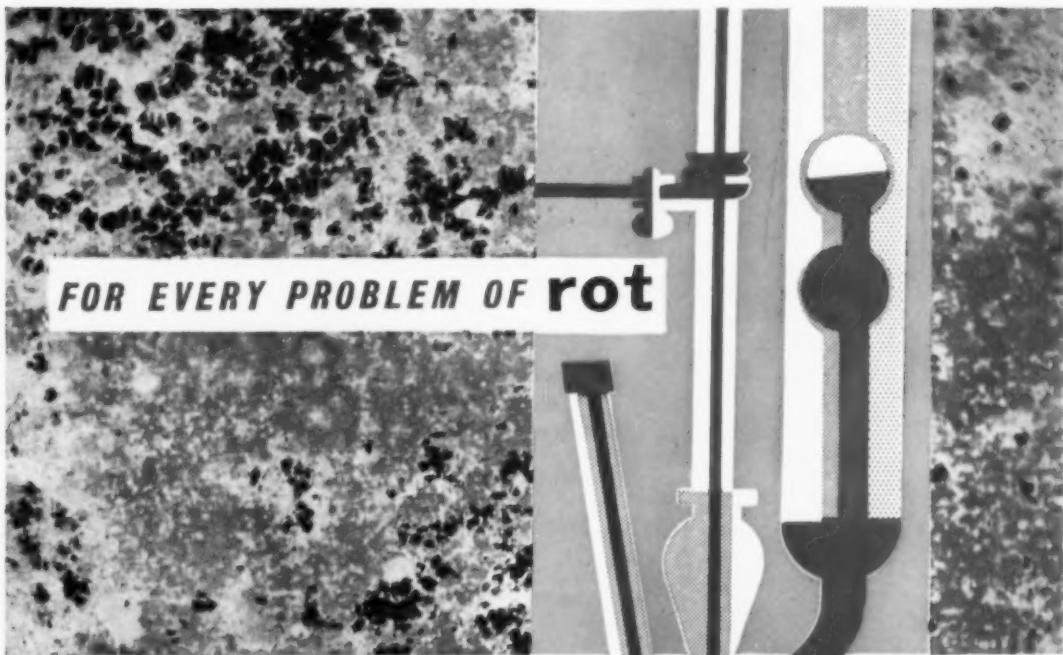


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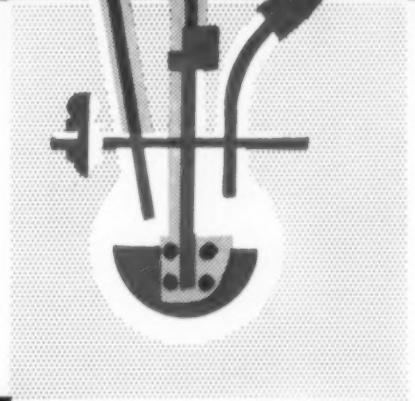
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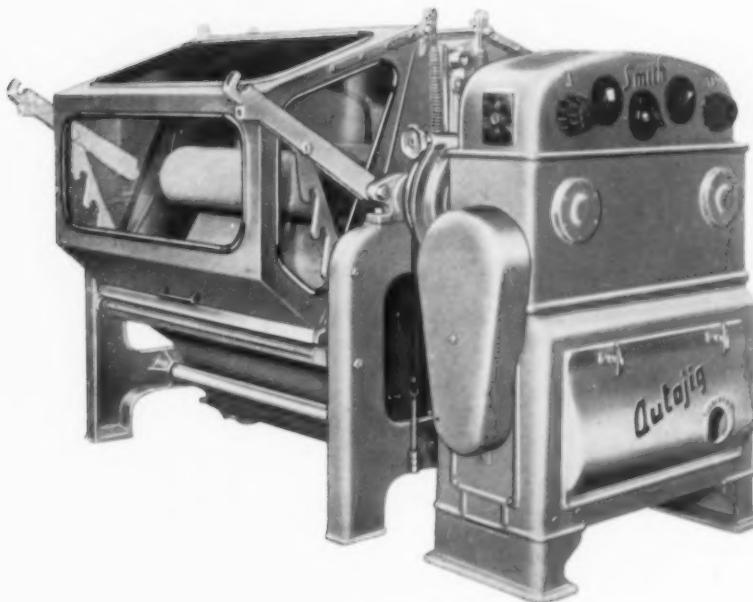
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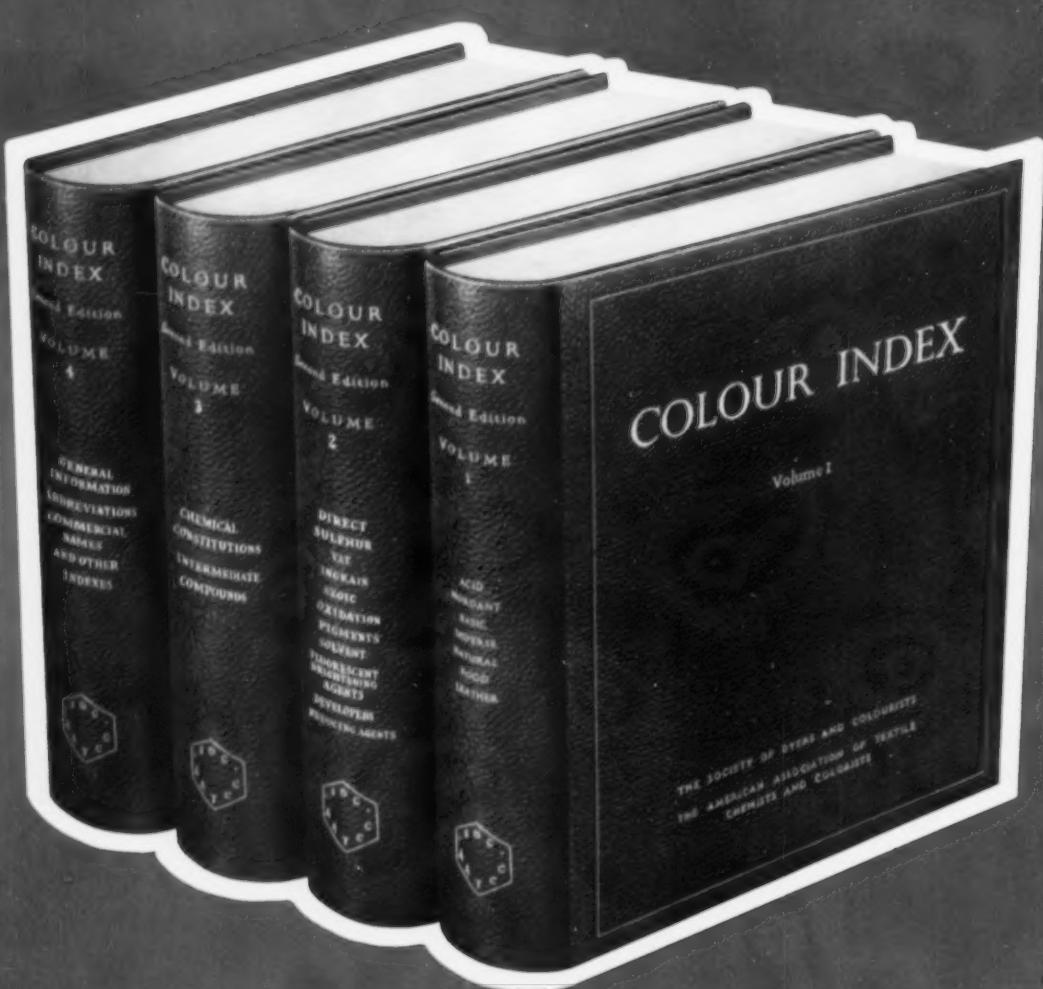
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- ★ A — (American) The methods of The American Association of Textile Chemists and Colorists.
- ★ B — (British) The methods of The Society of Dyers and Colourists.
- ★ C — (Continental) The methods of The Deutsche Echtheitskommission.

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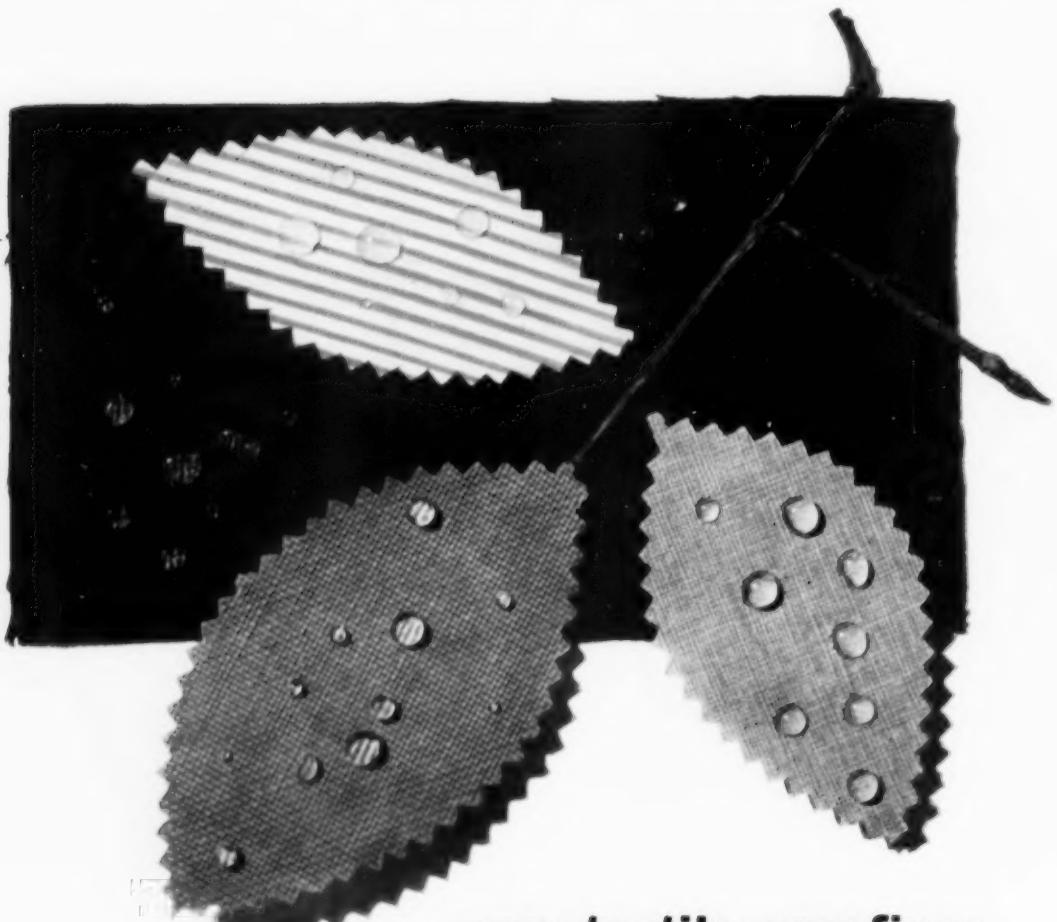
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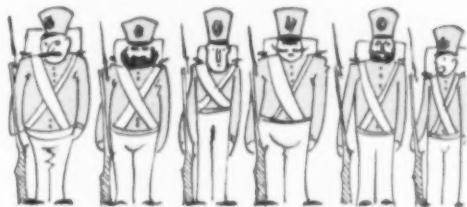
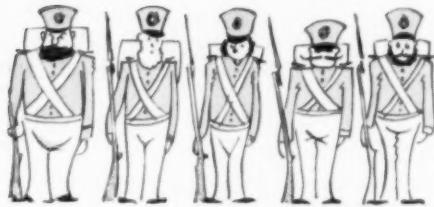
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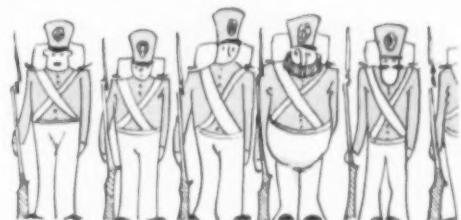
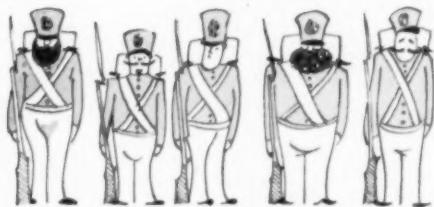
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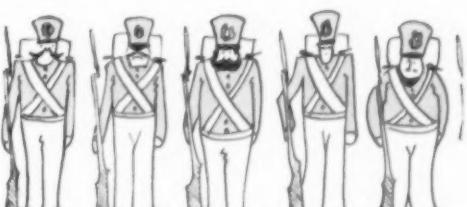
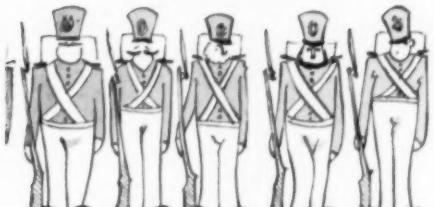
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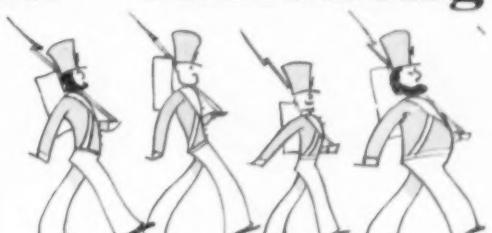
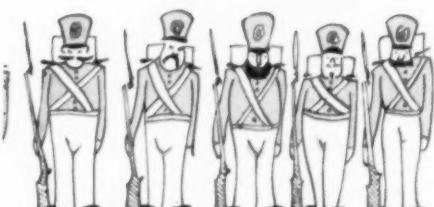
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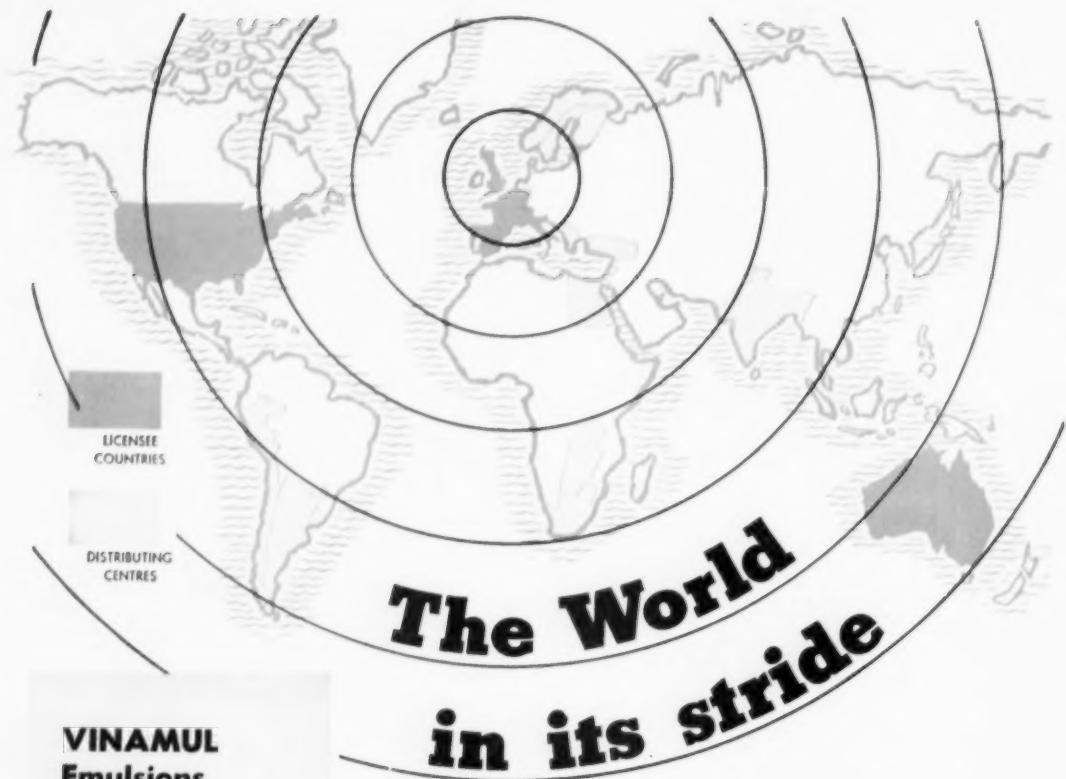
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COTTON**



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**BRAMLEY      LEEDS**

The attribution (p. 227) of the discovery of silicones to "Professor F. W. Perkin" instead of to Professor F. S. Kipping will cause many broad smiles, but this and other errors must seriously mar the work and reduce its value to students.

G. LANDELLS

**British Standard  
Glossary of Leather Terms**

B.S. 2780 : 1956

Pp. 24. London: British Standards Institution 1956. Price, 5s. 0d.

Explicitly, no attempt has been made to define every type of leather or every leather term, but, even so, about two hundred terms are listed together with their definitions. These are intended to be of use mainly in commerce dealing with leather or with hides and skins. In consequence, the processes of leather manufacture are not defined except when this is necessary in describing the products. The booklet is valuable and is produced well, but its price is high.

H. E. NURSTEN

**Dictionary of Leather Technology  
German-English English-German**

Compiled by W. O. Goulden. Consultant Editors for the English text: J. P. Danby and D. Woodroffe. Pp. 172. Cologne: Staufen-Verlag. Price, 28s. 7d.

This is a useful, slim volume, which could be greatly improved by careful revision to eliminate numerous errors, antiquated words, and those without technical meaning. The number of compound terms listed could be reduced, but, on the other hand, it would have been helpful if technical words had been explained more fully. Examples of errors are: Chebulinsäure is *chebulinic*, not "chebulic", acid, thin is not synonymous with viscous, and Brasilein is not brasilline acid. The following list of "English" words in the dictionary illustrates other criticisms: anticalcium, alkaliogenous, azotic acid, cuprum, and to hydrogenise. The book is very well produced and the type beautifully clear.

H. E. NURSTEN

**Polymer Solutions**

By H. Tompa. Pp. xiv + 325. London: Butterworths Scientific Publications (New York: Academic Press Inc.). 1956. Price, 55s. 0d. or \$8.50.

Much of our knowledge of the structure, size, and shape of polymer molecules and of their interaction with liquids has come from studies of the properties of polymer solutions. This book is mainly concerned with equilibrium properties, such as vapour pressure, osmotic pressure, and phase equilibria, which may be treated by the methods of thermodynamics and statistical mechanics. Viscosity and light scattering are also considered. Treatment is mathematical, but the physical significance of the relationships derived is not generally overlooked.

Following an introductory chapter in which polymers and chain-length distributions are briefly

discussed, there are two short chapters which summarise the relevant thermodynamic and statistical-mechanical concepts and formulae and apply them to pure liquids and solutions in general. In succeeding chapters, theories of polymer solutions, ranging from simpler lattice theories to the more recent dilute solution theories of Flory, are reviewed and applied to the consideration of measurements of vapour pressure, heats of mixing, and osmotic pressure. Polymer solutions containing polar components receive special consideration. There are chapters on phase relationships and chain configurations in which conditions of phase separation from binary and ternary systems are discussed and the random chain and other models considered. A chapter on viscosity considers its interpretation in terms of these models and the evaluation of molecular weights from viscosity measurements. A final chapter shows how light-scattering data provide information relating to the thermodynamic properties of the system, the molecular weight and chain-length distribution of the polymer, and its configuration in solution. Each chapter is provided with a list of references and there is a general bibliography.

The more specialised techniques of sedimentation and streaming birefringence are not considered, nor are polyelectrolytes, and there is little mention of cellulose derivatives. An author index would, perhaps, be a useful addition. The symbols used do not always conform with those used in other texts, and it is surely time that such symbols be standardised. Misprints and errors are virtually absent. Diagrams are very clear. To those with the necessary mathematical background this book provides a very good account of the properties of polymer solutions and will be of great value to those engaged in research on this subject.

W. R. MOORE

**Technique of Organic Chemistry  
Volume III**

**Part I—Separation and Purification**

Edited by A. Weissberger. 2nd revised edition 1956. Pp. ix + 873. London and New York: Interscience Publishers. Price, \$17.50 or 126s. 0d.

The first edition of this volume was published in 1950 and reviewed in this *Journal* in the same year (66, 547).

In the seven years since the publication of the original volume the many advances in the theory and practice of unit operations have necessitated considerable enlargement and modification to the text. The original work has now been arranged in a more systematic manner, and several new sections have been added. This has entailed the division of Volume III into two parts. Part I, which is published under the general title *Separation and Purification*, covers (i) Diffusion Methods, (ii) Laboratory Extraction and Counter-current Distribution, (iii) Crystallisation and Recrystallisation, (iv) Centrifuging, (v) Filtration, and (vi) Solvent Removal, Evaporation, and Drying. Part II, which is now published separately,

contains sections on Heating and Cooling and on Mixing, together with entirely new sections on Grinding, Screening, and Classifying, on Operations with Gases, and on the Selection of Materials for the Construction of Equipment.

The series, on the *Technique of Organic Chemistry*, is already familiar to most industrial chemists, its usefulness not being restricted, as the name might imply, to organic chemists. Volume III, perhaps, is most useful as a "first source" of information on a particular topic, a purpose for which it is well suited, since it contains a large number of references to original work and is very well illustrated. The layout and the contents of the chapters contained in the original volume have been modified only by the addition of new material. The main change is concerned with the rearrangement of the text, which, together with the addition of completely new sections, has necessitated the division into two parts.

This division of the volume is an advantage, since the new arrangement has enabled Part I to be devoted entirely to the processes involved in the separation, concentration, and purification of material. Of the additional material, a section on "Liquid-Liquid Extraction for Increased Quantities", written by E. G. Scheibel, forms a much needed addition to the chapter devoted to extraction. The first edition contained a chapter on Dialysis and Electrodialysis; this has been revised and enlarged, and now forms part of a chapter concerned with Diffusion Methods. This chapter is completed by sections devoted to Thermal Diffusion of Organic Liquids, to Barrier Separations, and to the technique of Zone Electrophoresis.

The new edition brings up to date techniques described in the first edition, but it is much more than a "revised reprint". The rearrangement of the chapters, together with the additional sections, has resulted in a volume which will be even more valuable to chemists than the earlier edition.

P. J. KING

### Semimicro Qualitative Analysis The Systematic Identification of Organic Compounds

By Nicholas D. Cheronis and John B. Entrikin. 2nd edition 1957. Pp. xiv + 774. New York and London: Interscience Publishers. Price, \$9.00.

Numerous books have been written on qualitative organic analysis, some attempting to reduce it to the well ordered system of qualitative inorganic analysis, others attempting to make the student use his brains. Any teaching institution contains exponents of both schemes, who tend to view new books in the light of one of these beliefs. This book is in the second "class" with the added interest of microtechniques.

Though the authors state that the book is intended for the use of all types of chemists, it is undoubtedly biased towards students of organic chemistry.

The book is divided into four parts. Part I describes apparatus, equipment, and methods of

semi-micro work and is of interest to any chemist working with organic compounds. The apparatus is well known, but some of the interesting techniques in micro-sublimation and -distillation will be new to many readers. Full use is made of the microscope, an instrument often neglected in organic chemistry, and the value of physical constants, other than routine melting points, is clearly shown. There is a good though condensed section on the use of chromatography in the identification and separation of compounds.

Part II, consisting of semi-micro methods of identification of "unknowns", is definitely for students, and the comprehensive collection of general and specific tests for functional groups is excellent. The preliminary classification of substances by solubilities and use of indicators appears rather unwieldy, whilst few students would be required to separate mixtures of compounds containing identical functional groups.

Part III gives clear instructions for the preparation of all the common and many unusual derivatives of each functional group. The description of a semi-micro preparation of a Grignard reagent is very interesting. Aldehydic and ketonic derivatives are discussed in separate chapters, but it seems a pity that these chapters should be widely separated from one another.

Part IV consists of a very comprehensive list of physical constants. The authors point out in Part I that literature melting points vary considerably with the source, and they can therefore be excused when isosorine occurs on two different pages with entirely different constants. Part IV ends with 24 pages on the physical constants of some physiologically active compounds.

An appendix lists the apparatus and chemicals required in a student laboratory for carrying out semi-micro techniques. This should be of considerable use to any lecturer who is trying to organise semi-micro work in the midst of his other duties.

Throughout the book there is an extremely comprehensive set of references to original papers and also, in appropriate chapters, some excellent questions for students. These questions are framed in such a way that the student is compelled to read the text thoroughly to obtain an answer.

In brief, the book is a thorough and comprehensive study. One feels, however, that it will be too heavy going for the average student, who usually requires something brief (and also cheap) for examination purposes. It should certainly be on the shelves of every organic chemistry library, but is probably biased too heavily towards the student reader for private book collections.

R. S. ASQUITH

### Proceedings of the International Wool Textile Research Conference (Australia 1955)

A rearrangement in the proposed volume sequence of these *Proceedings* has been made. The volumes now comprise—

A—General

- B**—Chemical Physics and Physical Chemistry of Wool and Proteins
- C**—Chemistry and Biochemistry of Wool, Proteins, Peptides, and Amino Acids
- D**—Physics of Wool and other Viscoelastic Fibres
- E**—Wool Technology
- F**—Histology of Wool and Hair and of the Wool Follicle

Volume A is bound in one cover with Volume B.

Volume F (pp. 228), which has been published first, includes material on *Histology of Wool and Hair and of the Wool Follicle* (which was originally to be Volume A).

The other volumes of the *Proceedings* have been distributed as they have become available. Relevant papers will be abstracted in this *Journal*.

C.J.W.H.

## Abstracts from British and Foreign Journals and Patents

*The titles of abstracts may be modified. Abbreviations of names of firms are listed in J.S.D.C., 68, 23 (Jan. 1952) and also, together with symbols and the periodicals abstracted, in the annual index*

### I—PLANT; MACHINERY; BUILDINGS

#### Machinery Developments in 1956

P. J. Wood

*Amer. Dyestuff Rep.*, 45, 904-910 (3 Dec. 1956)

A description of dyeing, finishing, printing, and weaving machinery made available in 1956. The article contains short notes and photographs of—a machine for washing after mercerising or printing; a printing machine for hosiery; a vertical roller printing machine; a machine for testing new print rollers; an automatic machine in which knitted goods may be set, scoured, rinsed, dyed, washed, finished, and dried in one process; a machine for padding tufted carpets; a machine for dyeing at atmospheric or high pressures; a new conditioning machine; a machine for continuous bleaching with sodium chloride; a homogeniser for colour or finish; a cutting machine for towels and scarves with a photoelectric guide; and a new Italian loom which weaves at 800 picks/min. for 24 hr. without shafts, sley, reed, or shuttle in complete silence. P.T.S.

#### PATENTS

#### Continuous Wet Treatment of Thread

Algemeene Kunstzijde Unie *BP* 768,128

#### Open-width Wet Processing

Spring's Cotton Mills *USP* 2,729,537

In a machine in which the fabric is led several times into and out of the liquor, the liquor is channelled across the width of the fabric so that it may be effectively counterflowed and so enable the treatment to be carried out in a much smaller space than has previously been possible. C.O.C.

#### Treating Moving Lengths of Material with Liquids

Toot Broadhurst Lee Co. *BP* 763,965

A method of applying size which enables strict control of the weight of size applied and which reduces to a relatively small quantity the amount of liquid which must necessarily remain at the end of a run. C.O.C.

#### Loading of Squeeze Rollers

Petrie & McNaught *BP* 766,901

#### Drying Paper, Cloth, etc.

Escher Wyss *BP* 768,198

The cloth is passed along an endless elastic conveyor having cells extending across its width. Water from the cloth which accumulates in the cells is withdrawn by suction heads placed at one or both sides of the conveyor. The strip covering the cells at the top of the edges of the conveyor projects beyond them. The packing between the conveyor and the suction heads takes place on the underside of both the projecting strip and the conveyor. C.O.C.

#### Measuring Changes in Length of Threads, Cloth or the like

Gebrüder Sucker *BP* 765,712

Change in length is measured by comparing the lengths that run past two different points during the same period, e.g. during the time it takes a standard length to run past one point the actual length running past another point is measured. The difference between the two lengths gives the amount of change in length of the material. This

method of measuring is much more accurate than those hitherto used. C.O.C.

#### Calender

Verkstds AB Calor *BP* 766,570

A perforated cylinder operates in conjunction with a heated bed. Within the cylinder there is a weighted core and at one end the cylinder is connected to a suction device so that moisture picked up by the cylinder cover can be continuously removed. C.O.C.

#### Mangle

Sir James Farmer Norton & Co. *BP* 767,301

Improved means for obtaining uniform distribution of pressure along the bowls. C.O.C.

#### Drive for Multicolour Printing Machines

Bollington Printing Co. *BP* 766,598

#### Drying Apparatus for Paper, Fabric, Textiles, etc.

A. C. Wilson *BP* 762,676

The dryer comprises a long, narrow U-shaped passage converging towards one end, into which a stream of heated air or gas is blown through an adjustable nozzle so that the static pressure of the expanding air or gas is substantially equal to the atmospheric pressure. The sheet moves in a direction opposite to that of the circulating air or gas. K.W.

#### Removing Excess Coating from Coated Fabric or the like

United States Rubber Co. *BP* 767,635

Control means for a knife which cuts off excess coating material protruding over the edge of the fabric. C.O.C.

#### Alphabetical List of New Products (IV p. 217)

### II—WATER AND EFFLUENTS

#### Use of Butyl Acetate to Purify the Waste Liquors of Aniline Dye Factories

A. M. Koganovskii and P. N. Tarau

*Ukrain. khim. zhur.*, 22, 401-404 (1956);

*Chem. Abs.*, 51, 727 (10 Jan. 1957)

The following are the partition coefficients between butyl acetate and neutral water: benzoic acid 30, phenol 50, *o*-hydroxybenzoic acid 126, *o*-aminophenol 2-6, *p*-nitrophenol 215, *o*-nitrophenol 191, 2:4-NH<sub>2</sub>(NO<sub>2</sub>)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>OH 42, aniline 27, and *o*-toluidine 53. Extraction with butyl acetate might be used to purify effluents with recovery of useful products. The effluent must be neutral, or aniline will not be extracted. C.O.C.

#### Treatment of Alkaline Sulphur Dye Wastes with Flue Gas

C. J. Beach and M. G. Beach

*Proc. Amer. Soc. Civil Engrs.*, 82 (8A5),

1078-1-1078-3 (1956);

*Chem. Abs.*, 51, 1609 (25 Jan. 1957)

Flue gas (12-14% CO<sub>2</sub>) flowed countercurrent to the wastes, which had pH 2-11 and contained up to 30 p.p.m. sulphides. All the sulphides were removed by adjusting the pH of the effluent to an equilibrium value of 6-4 and using a retention time of 22 min. C.O.C.

### III—CHEMICALS; AUXILIARY PRODUCTS; FINISHING MATERIALS

#### Complexons—A Bibliography of Analytical, Biological, and Industrial Applications

M. R. Verma and K. J. Theratil

*J. Sci. Ind. Research (India)*, 15 A, Supplement No. 9, 1–41 (1956); *Chem. Abstr.*, 51, 934 (25 Jan. 1957) C.O.C.

572 references.

#### Reactivity of Ionic Detergents with *Micrococcus lysodeikticus*

A. R. Gilby and A. V. Few

*Nature*, 179, 422–423 (23 Feb. 1957)

The action of four  $C_{12}$  detergents on *Micrococcus lysodeikticus* and its protoplasts is reported. Both the protoplast lytic concentrations and the bactericidal concentrations are in the order: dodecylamine hydrochloride < dodecytrimethylammonium bromide < sodium dodecyl sulphate < sodium dodecanesulphonate. It is suggested that the site of action of ionic detergents is a phosphatide constituent of the plasma membrane.

W.K.R.

#### Some Applications of Organic Diisocyanates and their Derivatives in the Textile Industry

P. Roche and M. Coupez

*Bull. Inst. Text. France*, (64), 15–27 (Dec. 1956)

A survey of recent work on possible applications of organic diisocyanates—(a) as cross-linking agents to promote insolubility and reduce swelling of hydrophilic polymers; (b) as adhesives for vinyl coatings on glass fibres; and (c) as fixing agents for hydrophobic substances for modification of the surface properties of textile materials.

J.C.F.

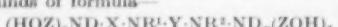
#### PATENTS

#### Polyalkylol Polalkylene Polyamine Derivatives—Detergents and Wetting Agents

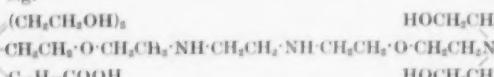
Dow Chemical Co.

BP 767,596

Compounds of formula—



(Y = alkylene or cycloalkylene interposing 2 or 3 C directly between the N atoms; X = alkylene interposing a chain of 2–12 C between the N atoms and may be interrupted by ether oxygen atoms; Z = straight or branched chain alkylene of > 1 C; R<sup>1</sup> and R<sup>2</sup> = H, alk of < 5 C,  $CH_3COOM$ ,  $CH_3CH_2COOM$ ,  $CH_3PO(OM)_3$ ,  $CH_3CH_2PO(OM)_2$  or  $CH_3CH_2SO_3M$  (M = H, alkali metal,  $NH_4$  or subst. ammonium); D = a soap-forming fatty acid; n = 0 or 1), e.g.—



obtained by treating stearic acid with *NN*’-di(2-imino-diethanethoxyethyl)-ethylenediamine, are detergents and wetting agents compatible with soap and resistant to heavy metal ions with which they form complex salts.

C.O.C.

#### Size

Monsanto

BP 761,933

Fumaric acid or maleic anhydride (0.05 to 0.7 mol.) is dissolved in molten rosin (1 mol.) containing < 0.2% volatiles, an alkaline material (NaOH,  $Na_2CO_3$ , etc.) and  $H_2O$  are added and the mixture is heated to 250–500°C. at 250–1000 lb./sq.in. pressure for 3–10 min. to give an improved non-forming size having 40–80% solids content and an acid no. of from + 35 to – 10.

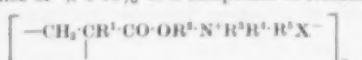
K.W.

#### Antistatic Agent

DuP

USP 2,729,577

Presence of < 0.05% of a compound of formula—



(R<sup>1</sup> = H,  $CH_3$  or  $C_2H_5$ ; R<sup>2</sup> = divalent hydrocarbon of 1–4 C; R<sup>3</sup>, R<sup>4</sup> and R<sup>5</sup> = aliphatic hydrocarbons of 1–3 C; X = hydrocarbon sulphate or carboxylate anion of 8–20 C; n > 10), e.g. poly- $\beta$ -methacryloyloxyethyldiethylmethyl ammonium methylsulphate, confers antistatic properties on synthetic hydrophobic materials, e.g. Terylene.

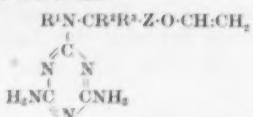
C.O.C.

#### Vinyl Ethers—Textile Finishes, Coating Agents, etc.

Rohm & Haas Co.

BP 765,792

Vinyl ethers of formula—



(Z = subst. or unsubst. methylene or polymethylene and may contain O or S atoms in the chain; R<sup>1</sup> = H or hydrocarbon of < 19 C and having H on the C attached to N; R<sup>2</sup> and R<sup>3</sup> = H, phenyl or alkyl; when R<sup>1</sup> = H then R<sup>2</sup> and R<sup>3</sup> = Alk, when R<sup>2</sup> or R<sup>3</sup> = H then R<sup>1</sup> = hydrocarbon) are obtained by treating dicyandiamide with a cyanamide of formula R<sup>1</sup>NCN-CR<sup>2</sup>R<sup>3</sup>-Z-O-CH<sub>2</sub>CH<sub>3</sub> in presence of a basic catalyst. They can be used as sizes, for imparting wet strength to paper, as coating agents, etc.

C.O.C.

#### Macromolecular Methylol Compounds—Emulsifying, Finishing, Thickening and Coating Agents

BASF

BP 768,598

Products of good solubility in water are obtained by treating unsaturated carboxylic acid amide-vinylactam copolymers, e.g. a copolymer of methacrylic acid amide and N-vinylpyrrolidone, in aqueous medium at pH > 5 with HCHO. They do not gelatinize but form stable mobile solutions which can be diluted to any extent. They have excellent emulsifying and dispersing properties and are useful as stabilising, thickening, binding, finishing and coating agents.

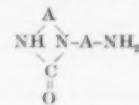
C.O.C.

#### Aminolysed Acrylic Ester Polymers

Rohm & Haas

BP 766,417

The products obtained by treating an acrylic ester with an aminosulkylen urea of formula—



(A = Alkylene of 2–3 C) are useful additives for cellulosic fibres or fabrics, e.g. for modifying the dyeing affinity or preventing gas fume fading of cellulose acetate.

W.G.C.

#### Ethyleneimine-Methylol-phosphorus Polymers

Albright & Wilson

BP 764,313

Development of BP 740,269 (J.S.D.C., 72, 40 (1956)). Polymers suitable for use in producing flame-resistant textiles and in plastics, paints, etc. are obtained by treating tetrakis(hydroxymethyl)phosphonium salts, trihydroxymethylphosphine oxide and their derivatives containing > 1 methylol group linked directly to a P atom with a monomer polymer or N-linked methylol derivative of ethylene imine or a C-substituted derivative thereof in which the substituents are aliphatic, alicyclic, aromatic, alkyl aromatic or aromatic alkyl groups. Thus ethylene imine is mixed with tetrakis hydroxymethyl phosphonium chloride in water when an exothermic reaction yielding a clear gel results. The gel on heating to 150°C. for several minutes becomes a hard brown solid insoluble in water or alkali. After standing at 20°C. for 20 min. it becomes resilient and swells greatly in water.

C.O.C.

#### Alkyd Resins containing Phosphorus

Albright & Wilson

BP 764,314

Polymers giving a flame-resistant finish to hydrophilic fibrous organic materials consist of the polyesters formed from a polycarboxylic acid and tetrakis(hydroxymethyl)phosphonium salts, trihydroxymethyl phosphine oxide and their derivatives containing > 1 methylol group linked directly to a P atom.

C.O.C.

#### Titanium Ester Complexes

National Lead Co.

BP 765,603

The reactivity of organic titanium esters can be controlled by addition of amines of formula  $NH_2\cdot C(R^1)_2\cdot (CR^2R^3)_2\cdot C(R^4)_2\cdot NHR^5$  (R<sup>1</sup> = H, OH or Alk of 1 or 2 C; R<sup>2</sup> = H or Alk of 1 or 2 C; R<sup>3</sup> = H, Alk of 1 or 2 C or an amino- or hydroxyl-substituted Alk of < 7 C; x = 0 or 1), e.g. ethylene diamine or  $\beta$ -aminoethylethanolamine.

C.O.C.

**Catalyst for the Curing of Glycidyl Polyethers on Textiles**

N.V. De Bataafsche Petroleum Maatschappij

BP 766,273

Salts of metals of at.wt. 24–210 with inorganic acids of formula  $H_a(X_wF_y)$  ( $X$  = non-metal of at.wt.  $> 2$ ;  $w$  and  $y$  = whole numbers;  $a$  = valency of the radical  $(X_wF_y)$ , e.g. zinc fluoroborate, are good catalysts for the curing of glycidyl polyethers.

C.O.C.

Alphabetical List of New Products (IV below)

Antistatic Agents as applied to Wool (X p. 232)

Rheology of Sodium Carboxymethylcellulose Solutions (XI p. 235)

Vinyl Acetate Resin Compositions (XIII p. 236)

**IV—RAW MATERIALS; INTERMEDIATES; COLOURING MATTERS**

**Alphabetical List of New Products**

*Amer. Dyestuff Rep.*, 45, 877–903 and 910 (3 Dec. 1956)

A list of dyes, textile chemicals, and wet-processing and laboratory equipment put on to the market in the U.S.A. or developed since November 1955.

P.T.S.

**Reaction of Sulphonation. XXXIX—Hydrolysis and Isomerisation of Naphthalenetrisulphonic Acids**

B. I. Karavayev and A. A. Spryškov

*J. Gen. Chem. U.S.S.R.*, 26, 2002–2005 (July 1956)

In stability to hydrolysis in 75–78%  $H_2SO_4$  at 161°C. the three trisulphonic acids formed in the direct sulphonation of naphthalene fall in the following order: 1:3:7 > 1:3:6 > 1:3:5. When heated in 96–100%  $H_2SO_4$  at 161°C., each of these isomers is converted into an equilibrium mixture containing 63% of the 1:3:6 isomer. Under the usual conditions of sulphonation used in the manufacture of H acid, tetrasulphonic acids are absent and about 72% of the 1:3:6 isomer is obtained.

A.E.S.

**Reaction of Sulphonation. XII—Hydrolysis and Sulphonation of Benzenedisulphonic Acids**

A. A. Spryškov and S. P. Starkov

*J. Gen. Chem. U.S.S.R.*, 26, 2862–2866 (Oct. 1956)

**Sulphonic Acids of Sulphones as By-products of Sulphonation Processes. III—Action of Sulphuric Acid on Diphenyl Sulphone and its Sulphonic Acids**

A. P. Shestov and N. A. Osipova

*J. Gen. Chem. U.S.S.R.*, 26, 2866–2872 (Oct. 1956)

The monosulphonic acid of diphenylsulphone undergoes cleavage to approx. 30% when treated with  $H_2SO_4$  (85–98%), but the corresponding disulphonic acid does not cleave under the same conditions.

G.J.K.

**Silver Tetrafluoroborate as a Catalyst in Electrophilic Aromatic Substitutions**

G. Oláh, A. Pavláth and S. Kuhn

*Chem. and Ind.*, 50 (12 Jan. 1957)

Silver tetrafluoroborate is a powerful new catalyst in electrophilic aromatic substitutions. The reactions are very vigorous, proceed rapidly, and, generally, give almost quantitative yields.

W.J.M.

**Nucleophilic Displacement Reactions in Aromatic Systems. VI—Influence of Nuclear Alkyl Groups in the Aromatic System. Kinetics of the Reactions of Chlorodinitrotoluenes and Related Compounds with Piperidine, Aniline, and Ethoxide Ions in Ethanol, and with Methoxide Ions in Methanol**

B. Capon and N. B. Chapman

*J.C.S.*, 600–609 (Feb. 1957)

From data obtained with 1-chloro-2:4-dinitrotoluene, 2-chloro-3:5-dinitrotoluene, 5-chloro-2:4-dinitrotoluene, 3-chloro-2:6-dinitrotoluene, 4-*tert.*-butyl-6-chloropyrimidine, 1-*tert.*-butyl-5-chloro-2:4-dinitro- and 1-*tert.*-butyl-3-chloro-4-nitrobenzene, 3-chloro-4-nitro- and 5-chloro-2-nitrotoluene, it is concluded that the polar effect of alkyl groups *meta* to the seat of substitution is predominantly inductive. Evidence is also provided of the primary steric effect of a methyl group *ortho* to the seat of substitution. It is also shown that a methyl or *tert.*-butyl group *meta* to the seat of substitution but *ortho*

to an activating nitro group may exert a secondary steric effect which is powerfully deactivating, especially in the case of 3-chloro-2:6-dinitrotoluene. The relevance of light-absorption data to this phenomenon is discussed.

H.H.H.

**Molecular Interaction and Colour. VI—Absorption Spectra of Molecular Complexes of *m*-Dinitrobenzene and of 2:4-Dinitrostilbene with 4-Dimethylaminostilbene**

V. A. Izmail'skii, A. N. Guseva, and E. S. Solov'eva

*J. Gen. Chem. U.S.S.R.*, 26, 1766–1778 (June 1956)

Further comparisons (see *J.S.D.C.*, 71, 192 (1956)) are made between the absorption spectra of complexes of the type A-[K]·H + H-[K]·B and epd. of the type A/[K]·B. The work follows the pattern of the previous investigation (*loc. cit.*), but a second  $NO_2$  group is introduced into one component of each complex (see title). The results of previous work are confirmed, and it is shown that the introduction of the second  $NO_2$  group produces the expected increase in the stability of the molecular complex.

A.E.S.

**Halogenoarylation of Unsaturated Compounds by Aromatic Diazo Compounds. I—Reaction of Benzenediazonium Chloride and Bromide with 1:3-Butadiene and some Reactions of 4-Chloro-1-phenyl-2-butene**

A. V. Dombrovskii and A. P. Terent'ev

*J. Gen. Chem. U.S.S.R.*, 26, 2776–2782 (Oct. 1956)

**Action of Light on Normal and *iso*-Diazooates**

R. J. W. Le Fèvre and J. B. Souza

*J.C.S.*, 745–753 (Feb. 1957)

The ultraviolet spectra, in aq. alkaline soln., of the normal and *iso*-diazooates from aniline, *p*-chloroaniline, *p*-bromoaniline, and sulphanilic acid differ notably in that each of the *iso* forms exhibits an absorption max. between 270 and 280  $\mu$ m. with  $\log \varepsilon = ca.$  4.1, while in the same wavelength region the normal salts all show a very broad inflection, the centre of which has  $\log \varepsilon = ca.$  3. These facts are held to be reconcilable with observations made previously on various substances containing the  $-N=N-$  group. Irradiation of the *iso*-diazooates from aniline, *p*-chloroaniline, and sulphanilic acid, which superimposes on any existing thermal equilibrium a photochemical one, causes formation of the normal isomers (on spectral evidence) accompanied by irreversible decomposition. Despite the latter, signs of reversal on storage in the dark are detectable. The actions of light on the single diazoates from *o*-, *m*-, and *p*-nitroanilines are discussed: illumination does not change their absorption patterns in directions expected by analogy if normal isomers were being generated. The ability of many *iso*-diazooates to couple with  $\beta$ -naphthol is emphasised.

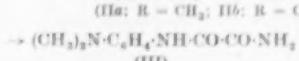
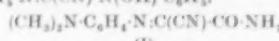
H.H.H.

**Ehrlich-Sachs Reaction**

F. Bell

*J.C.S.*, 516–518 (Feb. 1957)

The course of the reaction between *NN*-dimethyl-*p*-nitrosoaniline and cyanoacetamide is established as initial formation of I, which, when heated in methanol, loses HCN and passes into IIa or into IIb in ethanol, and thence into III by passage of steam into suspensions of I, IIa, or IIb in aq.  $K_2CO_3$  soln. Nitrosobenzene with cyanoacetamide, methyl cyanoacetate, or ethyl cyanoacetate does not yield normal Sachs compounds, but gives  $C_6H_5N:C(CN)-N(OH)-C_2H_5$ .



H.H.H.

**Oxidative and Oxidative-Hydrolytic Transformations of Organic Molecules. XXVIII—Oxidative-Hydrolytic Transformations of Nitro Hydroxyazo Dyes**

O. M. Shemyakina, B. M. Bogoslovskii, and M. M. Shemyakina

*J. Gen. Chem. U.S.S.R.*, 26, 1940–1945 (July 1956)

When 4-(3:5-dinitrophenylazo)- and 4-(2:4-dinitrophenylazo)-1:2-naphthalenediol are heated in alkaline

soln., they are decomposed—the first very readily, even at pH 9, and the second only after long boiling with 1% aq. NaOH. The azo dyes react in the hydrazone form with liberation of the dinitrophenylhydrazine, which then decomposes further. The end-products from the second dye are identified as phthalic and phthalonic acids, 5-nitrobenzotriazole, and 2:4-dinitrophenol. A.E.S.

#### Substantivity of Some Azo Derivatives of *p*-Diamines

G. Modena

*Ricerca sci.*, **26**, 1853–1858 (1956);  
*Chem. Abstr.*, **51**, 726 (10 Jan. 1957)

The substantivity of bisazo compounds of type  $(Ar-N:C_6H_4)_2X$  ( $X = CH_2, S, O, Se$ , or  $SO_2$ ) was investigated by the Peters and Vickerstaff method and compared with that of the allied benzidine compounds and C.I. Direct Red 28. Evidence has been obtained which shows clearly that this last dye has greater affinity than all the other dyes because of its long and planar linear structure, whereas the other dyes have definitely angular structures. The substantivity value (thermodynamic affinity) value— $-\Delta\mu_0$  decreases in the order: C.I. Direct Red 28 type  $> CH_2(C_6H_4N:N:Ar)_2 > C_6H_4N:N:Ar$ . The central group  $X$  imparts substantivity; when  $CH_2$  is replaced by  $SO_2$  substantivity decreases by about 40%, while substitution by  $O, S$ , or  $Se$  gives increases in substantivity of 40, 20, and 30% respectively. Presence of a  $CH_2O$  group increases substantivity by about 40%. C.O.C.

#### Effect of Steric Factors on the Properties of Dyes containing the Diphenyl Nucleus. V—Colour and Substantivity of Disazo Dyes from 2:6-Dimethylbenzidine and Naphthidine

B. M. Krasovitskii and T. A. Serova

*Ukrain. khim. zhur.*, **22**, 368–372 (1956);  
*Chem. Abstr.*, **51**, 721 (10 Jan. 1957)

Measurements of  $\lambda_{max}$  in  $\mu\mu$  in water ( $W$ ) and on Cellophane ( $C$ ) and the substantivity ( $S$ ) in % were made of five dyes:  $(2:4-CH_2(RN_2)C_6H_4)_2$  (I) 550, 565, 24;  $2:4-CH_2(RN_2)C_6H_4C_6H_4N_2R$  560, 605, 57;  $2:6:4-(CH_2)_2(RN_2)C_6H_4C_6H_4N_2R$  565, 585, 12;  $[4-RN_2C_6H_4]_2$  (II) 595, 625, 31;  $1-RN_2C_6H_4$  540, 550, —. Low values of  $S$  are caused by the planes not being coplanar and so not fitting well to the carbohydrate structure. The difference between  $W$  and  $C$  is interpreted as being caused by the rings becoming more coplanar in association with the substrate. Small differences result from structures that are sterically so hindered that they cannot alter much. I is more hindered than II. A low value for  $S$  is a more sensitive index of non-coplanarity than is the  $W-C$  difference. C.O.C.

#### Dyes from Carbazole Derivatives

N. Kuroki and K. Konishi

##### I—Synthesis of Naphthol Bases

*J. Soc. Org. Synth. Chem., Japan*, **12**, 29–34 (1954)

4-Amino-, 6-aminotetrahydro-, and 6-aminohexahydrocarbazole were synthesised, and hue and fastness properties of derived dyes examined. Introduction of a benzoyl or acetyl group into the 9-position had a hypsochromic effect and caused an increase in fastness.

##### II—Synthesis of Disperse Azo Dyes

*Ibid.*, 415–417

Ethylation or hydroxyethylation (with ethylene oxide) of hexahydrocarbazole gives 9-alkyl derivatives, which couple with diazotised *p*-nitroaniline and its derivatives to give disperse azo dyes.

##### III—Synthesis of Sulphur Dyes

*Ibid.*, 461–463

9-Ethyl(or hydroxyethyl)carbazole and their hexahydro derivatives were condensed with *p*-nitro- or *p*-aminophenol to give indophenols, which were treated with alcoholic or aq.  $Na_2S_2O_4$  to give violet and black sulphur dyes. E.S.

#### Fluorene Derivatives. III—Synthesis of Disperse Azo Dyes

M. Hyashi and N. Ishikawa

*J. Soc. Org. Synth. Chem., Japan*, **12**, 213–221 (1954);  
*Chem. Abstr.*, **51**, 721 (10 Jan. 1957)

Diazotised 2-aminofluorene was coupled with aniline and its *N*-alkyl and *N*-hydroxylalkyl derivatives, etc., to give yellow to red disperse dyes. E.S.

#### Condensations of Aryldiazonium Salts with Reactive Unsaturated Compounds. VIII—Action of Aryldiazonium Chlorides with $\beta$ -4-Methoxy- and $\alpha$ -3:4-Dimethoxy-benzoylacrylic Acids

H. S. Mehro and K. B. L. Mathur

*J. Indian Chem. Soc.*, **33**, 618–620 (Aug. 1956)

Benzenediazonium chloride and its nitro and halogeno analogues react with the two acrylic acids to give the corresponding dialkones in yields of 7–23%. The methoxy derivatives appear to be more reactive than the parent benzoylacrylic acid:  $Ar-N_3Cl + CH_3O-C_6H_4-CO-CH_2-COOH \rightarrow CH_3O-C_6H_4-CO-CH_2-CH=Ar$ . C.H.R.

#### Complex Fluorides. VIII—Preparation and Properties of Salts of the Triphenylmethyl Cation: Infrared Spectrum and Configuration of the Ion

D. W. A. Sharp and N. Sheppard

*J.C.S.*, 674–682 (Feb. 1957)

#### Spectra and Halochromism

##### I—Halochromism of Aromatic Carbinols

V. F. Lavrushin

*J. Gen. Chem. U.S.S.R.*, **26**, 2697–2704 (Oct. 1956)

Absorption spectra of solutions of various mono-, di-, and tri-phenylcarbinols in conc.  $H_2SO_4$ , in 90%  $CCl_4$ –COOH, and in conc.  $H_2SO_4$ –glacial acetic mixture are studied between 2000 and 5000 Å. All the carbinols, irrespective of the number of aromatic radicals in the molecule, exhibit halochromism, and the colour is explained on the basis of the formation of carbonium salts. Methyldiphenylcarbinol exhibits anomalous behaviour, but no explanation is given. Graphs and 29 references are given.

##### II—Halochromism of Tertiary Alicyclic and Aliphatic Alcohols

V. F. Lavrushin and N. N. Verkhovod

*Ibid.*, 2704–2710

Absorption spectra of various cyclohexanols and trialkylcarbinols in conc.  $H_2SO_4$  are studied between 2000 and 5000 Å. The characteristic spectra are considered to be due to formation of carbonium ions. G.K.

#### Synthesis of Aliphatic-aromatic Unsaturated Alcohols; Analogues of Triphenylcarbinol. III—Aliphatic-aromatic Analogues of the Triphenylmethane Dyes

B. N. Dashkevich and I. V. Smolanka

*Ukrain. khim. zhur.*, **22**, 347–350 (1956);

*Chem. Abstr.*, **51**, 724 (10 Jan. 1957)

$p-N(CH_3)_2-C_6H_4-CH_2-CH-CO-CH_3$  and  $C_6H_4-CH_2-CH-CHO$  in ethyl alcohol containing NaOH form  $p-N(CH_3)_2-C_6H_4-CH_2-CH-CO-CH_2-C_6H_5$  (I), which with  $C_6H_5-NH-C_6H_5$  and  $POCl_3$  in dichloroethane forms the fast-to-light brownish-red basic dye ( $p-N(CH_3)_2-C_6H_4-CH_2-CH-NH-C_6H_5$ ). Similarly ( $p-N(CH_3)_2-C_6H_4-CH_2-CH-CO$  and  $(C_6H_5)_2NH$  form the blue dye ( $p-N(CH_3)_2-C_6H_4-CH_2-CH-CO-C_6H_5$ ) ( $C_6H_5-NH-C_6H_5$ )Cl, I and  $RMgI$  form carbinols which are converted to dyes by HCl. The dye chlorides (III) form picrates (IV). Some 1:2 addition to ketones was observed. C.O.C.

#### Reactions of Thin Films of Basic Dyes in the Dark

A. T. Vartanyan

*Izvestiya Akad. Nauk S.S.R., Ser. Fiz.*, **20**, 448–454 (1956);

*Chem. Abstr.*, **51**, 725 (10 Jan. 1957)

Thin layers of Methylene Blue (C.I. Basic Blue 9), Crystal Violet (C.I. Basic Violet 3), Rhodamine B (C.I. Basic Violet 10), Rhodamine G (C.I. Basic Red 8), and Rhodamine 6G (C.I. Basic Red 1) were obtained by vacuum distillation. The Methylene Blue layers changed their absorption characteristics on storage in air. Layers of Crystal Violet deposited by sublimation and by evaporation of an alcoholic solution had different spectral absorptions; this was true also of C.I. Basic Violet 10, where a colourless substance is formed on sublimation, this substance reverting to the dye when treated with water or when exposed to light. C.I. Basic Red 1 behaves similarly. C.I. Basic Blue 9 exposed to water vapour (20 mm. Hg) at 135°C. becomes colourless, and the colourless material can be sublimed on to glass plates. Crystal Violet distilled in an atmosphere of water vapour gives colourless layers. Presumably these colourless compounds are carbinol bases of the dyes. C.O.C.

### Nature of Concentration Effects in Rhodamine Solutions

V. L. Levshin and E. G. Baranova

*Izvestiya Akad. Nauk S.S.R., Ser. Fiz.,*  
20, 424–432 (1956);  
*Chem. Abstr.*, 51, 855 (25 Jan. 1957)

Absorption curves are given of aqueous solutions of Rhodamine 3B (C.I. Basic Violet 11) and Rhodamine 6G (C.I. Basic Red 1). The pH changes from 6.9 to 3.4 when the concentration of 3B is increased from  $10^{-4}$  to  $2 \times 10^{-3}$  g./ml. If the pH is adjusted by introduction of acid or alkali, there is no change in the absorption curve. Only absorption spectra in the visible region caused by  $\pi$ -electrons are affected by conen. Absorption spectra in conc. soln. lose their second maximum at  $556 \times 10^{12}$  sec.<sup>-1</sup> when the temperature is increased to 80°C. The luminescence is increased at higher temperature because of dissociation to monomers, which can luminesce. The degree of association calculated from absorption spectra is for 6G 4% at  $3 \times 10^{-4}$  g./ml. and 94% at  $1.5 \times 10^{-3}$  g./ml. For 3B at  $2 \times 10^{-3}$  g./ml. the association is 100% at 20°C. and 24% at 80°C. C.O.C.

### Naphthofuroxan and its Derivatives. VI—Bisulphite Compound of 7-Nitronaphthofuroxan and its Derivatives

S. V. Bogdanov and N. I. Zil'berman

*J. Gen. Chem. U.S.S.R.*, 26, 2071–2076 (July 1956)

Like the bisulphite cpd. of naphtho[1,2]furazan (see J.S.D.C., 70, 366 (1954)), the bisulphite cpd. of naphthofuroxan (see loc. cit., 308) is nitrated in the 7-position (Ring Index numbering for naphtho[1,2]furazan). The resulting 7-nitronaphthofuroxan bisulphite cpd. is converted by weak alkali into a mixture of 4-amino-3,7-dinitronaphthalene-1-sulphonic acid (I), 7-nitronaphtho[1,2]furazan-5-sulphonic acid (II), and other substances, and it is converted by caustic alkali into the dioxime of 6-nitro-1,2-naphthaquinone-4-sulphonic acid (III). Heating of I with 40%  $H_2SO_4$  converts it into 2,6-dinitro-1-naphthylamine, and treatment of I with  $K_2CO_3$  soln. gives 2,6-dinitro-1-naphthol-4-sulphonic acid (IV). With dil.  $HNO_3$  IV gives 2,4,6-trinitro-1-naphthol. III is oxidised by  $HNO_3$  to 7-nitronaphthofuroxan-5-sulphonic acid and is converted by caustic potash into II. Reaction of II with hypochlorite gives 5-chloro-7-nitronaphtho[1,2]furazan. A.E.S.

### Rearrangement of isoQuinoline-N-oxides

M. M. Robison and B. L. Robison

*J. Org. Chem.*, 21, 1337–1341 (Dec. 1956)

### Absorption Spectra of Unsymmetrical Cyanines

G. Araki and S. Fujinaga

*Progr. Theoret. Phys. (Japan)*, 15, 307–321 (1956);  
*Chem. Abstr.*, 51, 80 (10 Jan. 1957)

The absorption maximum (I) of an unsymmetrical cyanine (II) with two different nuclei (III) is generally of shorter wavelength than the mean value of I of two symmetrical cyanines with the respective nuclei. As the simple free-electron model (IV) in a square potential well cannot account for this deviation, two other models are proposed. The first is a modified IV got by using Poeschel-Teller potential, while the second is of Herzfeld-Sklar type, which considers the interaction between the various chemical structures of II. The influence of III is introduced in the first model by modifying the potential well, and in the second model by attributing greater stability to the ionic states. Both models produce fairly good results and account for the general behaviour of II. C.O.C.

### Synthesis of $\alpha$ -Acyl-substituted Cyanine Dyes

K. Taki

*Repts. Sci. Research Inst. (Japan)*, 32, 81–88 (1956);  
*Chem. Abstr.*, 51, 373, 722 (10 Jan. 1957)

Condensing 2-acylmethyl heterocyclic quaternary compounds with aldehydes yields  $\alpha$ -acyl-substituted trimethinecyanines, semithianines, and trinuclear cyanines. C.O.C.

### Paper Chromatography of Sensitising Dyes

R. A. Jeffreys

*Sci. et Ind. phot.*, 27, 392–394 (1956);  
*Chem. Abstr.*, 51, 897 (25 Jan. 1957)

Investigation of the spatial configuration of sensitising dyes has proved important when photographic sensitising

ability is correlated with molecular structure. Further information concerning dye spatial arrangements can be obtained from paper-chromatographic studies. The  $R_f$  values of Methylene Blue (C.I. Basic Blue 9) and 47 cyanine dyes, mostly trimethinecyanines, were determined by ascending chromatography on Whatman No. 1 paper in sealed glass cylinders with  $C_6H_6OH$ -water (80:20) as eluent. The  $R_f$  values were almost unaffected by the anions of the dye. Progressive addition of fused aromatic rings to the dye heterocycles reduces the  $R_f$  values for planar dyes, except for two 4-pyridine dyes tested. In the naphtho series, dyes with a  $\beta$ -naphtha configuration have the higher  $R_f$  values. Phenyl substitution in the oxazole dye series increases the  $R_f$ . Adsorption increases with increased methin chain length in three vinylgous series tested. In the symmetrical carboncyanine derivatives of benzazoles, differing only in  $N$ -alkyl groups, the  $R_f$  value increases with increasing number of C atoms in the  $N$ -alkyl groups. Sterically compact dyes, in which group the strong sensitising which readily form J-aggregates are formed, have anomalous  $R_f$  values lower than those of closely related dyes with "loose" configurations. Non-planar dyes show abnormally high  $R_f$  values. Bis(1-ethyl-2-quinoine)methinecyanine iodide, which aggregates in aqueous solutions of sufficient strength, is non-planar in the monomolecular state. The crowding in these molecules is progressively reduced by replacing 2-quinoine nuclei by benzothiophene nuclei, until a compact configuration is attained in the symmetrical thiocyanine molecule. More than one mechanism (ion exchange, partition, hydrogen bonding) is required to account for the adsorption of a cyanine dye on cellulose. C.O.C.

### Absorption Spectra of Dibenzothiacyclobcyanine Dyes in Water-Gelatin Solutions

A. V. Borin

*Zhur. nauch. i prikladn. fot. i kinematograf.*, 1,  
111–117 (1956);  
*Chem. Abstr.*, 51, 854 (25 Jan. 1957)

The absorption spectra from 450 to 700 m $\mu$ . were measured of solutions of 3,3'-dimethyl-9-ethyl-4:5:4':5':dibenzothiacyclobcyanine chloride (I) in water containing 10% gelatin (II) after being kept at different temperatures for various times. Aqueous solutions of I containing 1% agar-agar, pepsin, peptone, e.g. albumin, and blood albumin, respectively, were also studied. Data are given as graphs and tables.  $\beta$ -Phase formation occurs in all solutions containing albuminoid substances or amino acids, and it seems that the  $\beta$ -phase is formed by the cations of I reacting with the ionised carboxyl groups of amino acids, albumins, and to some extent II. The mesophase of I is formed by electrostatic interaction of the cations of I with anions in the solution. The increased intensity of the  $\beta$ -band of absorption in solutions of dispersed II is caused by the increased reactivity of II, which favours formation of the  $\beta$ -phase. The decrease of intensity of the  $J$  bands is due to the solvent action of the decomposition products of II of low mol. wt. C.O.C.

### Azamethin Dyes

B. S. Portnaya, N. S. Spasokukotskii, N. F. Turitsyna, T. P. Bobkova, G. I. Arbuzov, and I. I. Levkoev

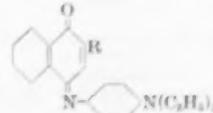
I—Colour of some Indoaniline Dyes derived from 2-Substituted 1-Naphthol

*J. Gen. Chem. U.S.S.R.*, 26, 2537–2546 (Sept. 1956)

II—Indoaniline Dyes derived from 1-Hydroxy-2-naphthanalide

*Ibid.*, 2546–2554

Dyes of general formula—



(R = H, Cl, Br, CO-CH<sub>3</sub>, COOH, COOCH<sub>3</sub>, CO-NH-C<sub>6</sub>H<sub>5</sub>, CO-NH-C<sub>6</sub>H<sub>4</sub>, CO-NH-C<sub>6</sub>H<sub>3</sub>(1- and 2-), CO-N(C<sub>6</sub>H<sub>5</sub>)<sub>2</sub>, CO-N(CH<sub>3</sub>)C<sub>6</sub>H<sub>4</sub>, CO-N(C<sub>6</sub>H<sub>5</sub>)<sub>2</sub>, CO-N(C<sub>6</sub>H<sub>5</sub>)<sub>2</sub>-C<sub>6</sub>H<sub>3</sub>(1- and 2-), SO<sub>3</sub><sup>-</sup>NH-C<sub>6</sub>H<sub>5</sub>, SO<sub>3</sub><sup>-</sup>N(C<sub>6</sub>H<sub>5</sub>)C<sub>6</sub>H<sub>5</sub>).

$\text{SO}_3\text{N}(\text{C}_6\text{H}_5)_3$ , and  $\text{CO-NH-C}_6\text{H}_4\text{R}'$ , in which  $\text{R}' = o$ ,  $m$ , and  $p$ - $\text{CH}_2\text{Cl}$ ,  $\text{NO}_2$ ,  $\text{NH}_2$ ,  $\text{N}(\text{CH}_3)_2$ , and  $\text{NH-CO-CH}_3$ , are synthesised and their absorption spectra in methanol soln. are determined. The value of  $\lambda_{\text{max}}$  is least when  $\text{R}' = \text{H}$ , and its value increases roughly in accordance with the electronegative character of  $\text{R}'$ . However, when  $\text{R}' = \text{COOH}$  or  $\text{CO-NH-X}$  (see above),  $\lambda_{\text{max}}$  is very high, as compared with compounds for which  $\text{R}'$  is of similar electronegative character (e.g.  $\text{CO-N}(\text{C}_6\text{H}_5)_3$ ). This is attributed to chelation through a hydrogen bond to the quinone oxygen. The effect of the nature of  $\text{X}$  is the subject of the second paper, which concerns espd. for which  $\text{R}' = \text{CO-NH-C}_6\text{H}_4\text{R}'$ . Introduction of electropositive and electronegative  $\text{R}'$  groups causes small hypsochromic and bathochromic shifts, respectively. A.E.S.

#### Azamethin Dyes derived from Oxindole—II

M. S. Kisteneva

*J. Gen. Chem. U.S.S.R.*, 26, 2019–2025 (July 1956)

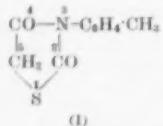
Dyes differing from those already investigated (see J.S.D.C., 72, 448 (1956)) in having a substituent ( $\text{CH}_3$ ,  $\text{OH}$ ,  $\text{OCH}_3$ ,  $\text{NH-CO-CH}_3$ ,  $\text{NO}_2$ ,  $\text{Br}$ ) in the 5-position of the oxindole ring system are synthesised, and their absorption spectra in alcohol soln. are measured. The introduction of  $\text{CH}_3$ ,  $\text{OH}$ ,  $\text{OCH}_3$ , or  $\text{NH-CO-CH}_3$  in the 5-position produces either no effect or a slight hypsochromic shift, whereas the introduction of  $\text{NO}_2$  or  $\text{Br}$  produces an appreciable bathochromic shift. A.E.S.

#### Reactions of 3-*o*-Tolyl- and 3-*p*-Tolyl-2:4-thiazolidiones

P. N. Bhargava, R. P. Rao, and M. S. Sastry

*J. Indian Chem. Soc.*, 33, 596–598 (Aug. 1956)

3-*o*- and 3-*p*-Tolyl-2:4-thiazolidiones (I), which were obtained by condensing the corresponding ditolylthiourea with chloroacetic acid, react with aldehydes and diazonium salts to give 5-substituted derivatives. With mercuric acetate substitution takes place in the tolyl residue giving the 3-acetoxymercuritoly compound.



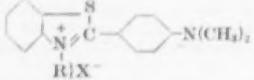
C.H.R.

#### Steric Hindrance in Quaternary Salts of 2-Arylbenzothiazoles and 2-Arylbenzoselenazoles

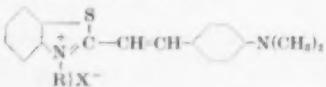
A. I. Kipriyanov and V. A. Shubovich

*J. Gen. Chem. U.S.S.R.*, 26, 2891–2896 (Oct. 1956)

Absorption spectra of compounds of types I and III—



(I:  $\text{R} = \text{H}$ ; II:  $\text{R} = \text{CH}_3$  or  $\text{C}_2\text{H}_5$ )



(III:  $\text{R} = \text{H}$ ; IV:  $\text{R} = \text{CH}_3$  or  $\text{C}_2\text{H}_5$ ) and the corresponding quaternary salts (II and IV) are studied in alcoholic solution. The hypsochromic shift from I to II (not shown from III to IV) is explained on the basis of intramolecular steric hindrance. G.J.K.

#### Mechanism of Dye Formation in Colour Photography

L. K. Tong and M. C. Giesmann

#### III—Oxidative Condensation with *p*-Phenylenediamines in Aqueous Alkaline Solutions

*J. Amer. Chem. Soc.*, 79, 583–592 (1957)

Investigation by the steady-state flow method of the kinetics of the oxidative condensation of *p*-phenylenediamine and *p*-aminodialkylanilines with derivatives of *o*-naphthol at pH 8–12 shows that the rates are proportional to the concentrations of the quinonediimines and

of the naphtholate ions. Apparently the rate-determining step of the over-all reaction is the formation of the leuco dye by a bimolecular resection of the above species. This is followed by rapid conversion of the leuco dye to the respective dyes. With different quinonediimines there is approximate proportionality between rates of deamination and rates of coupling with a given coupler.

#### IV—Oxidative Condensation in Acidic Aqueous Solutions

*Ibid.*, 592–595

Investigation of the kinetics of the oxidative condensation between *p*-amino-*NN*-dimethylaniline and 2-methyl-4-chlorophenol in acid buffers has shown that the rates are proportional to the concentration of the holquinoid oxidation product of the *p*-amino-*NN*-dimethylaniline, i.e. it is the same as in alkaline solution, so that statements in the literature are incorrect. A method of using the rates of the coupling reaction to estimate the equilibrium constant of the semiquinone formation is described.

C.O.C.

#### Triazines. XVII—*s*-Triazines from *s*-Triazine-2,4,6-tricarboxylic Acid

C. Grundmann and E. Kober

*J. Org. Chem.*, 21, 1392–1394 (Dec. 1956)

#### Dyes for Synthetic Fibres. V—Synthesis of Disperse Dyes containing a Triazine Ring

T. Endo, K. Katagiri, and G. Aida

*Research Repts. Fac. Textile and Sericul.*

*Shinshu Univ.*, 5, 135–137 (1955);

*Chem. Abs.*, 51, 1609 (25 Jan. 1957)

Synthesis of dyes containing both the triazine ring and one or two salicylic acid groups is described. They are substantive to Vynylon or cellulose acetate but not to cotton.

C.O.C.

#### Influence of Organic Impurities on the Aggregation of Dyes in Aqueous Solution

K. L. Arvan

*Izvestiya Akad. Nauk S.S.R., Ser. Fiz.*

20, 443–447 (1956);

*Chem. Abs.*, 51, 725 (10 Jan. 1957)

Absorption spectra are given of solutions of dyes, e.g. Methylene Blue, C.I. Basic Blue 9, and Rhoduline Orange, C.I. Basic Orange 14, in mixtures of water and an organic solvent (e.g. methyl, ethyl, propyl, butyl, or amyl alcohol), formamide, pyridine, acetone, and glycerol. The ratio  $\gamma$  of the maxima of the long-wave and the short-wave bands indicates the degree of association; it depends on the nature of the solvents, increases rapidly with small amounts of organic solvent, and later remains constant for a range of mixtures. This suggests that formation of complexes between dye and solvent (especially pyridine and quinoline) prevents aggregation of the dye. The complex-forming activity of pyridine is attributed to hydrogen-bond formation. C.O.C.

#### Metachromasy of Methylene Blue (C.I. Basic Blue 9)

I. Yoshimoto

#### I—Effect of Salts on the Absorption Spectrum of Methylene Blue

*Osaka Daigaku Igaku Zasshi*, 8, 465–468 (1956);

*Chem. Abs.*, 51, 854 (25 Jan. 1957)

An aq. soln. of Methylene Blue (C.I. Basic Blue 9) ( $1.66 \times 10^{-6}$  M.) had an absorption maximum at 665 m $\mu$ . ( $\alpha$ -band) and shoulder at 615 m $\mu$ . ( $\beta$ -band). The ratio of optical densities at these points  $R = E_{615}/E_{665}$  was 0.58 at 28°C. Addition of salts to the soln. increased the  $\beta$ -band and decreased the  $\alpha$ -band, and therefore increased  $R$ . The order of increase in n. soln. wns — for chloride:  $\text{Na}^+ > \text{K}^+ > \text{Mg}^{2+} > \text{Ca}^{2+} > \text{Ba}^{2+}$ ; for Na salts:  $\text{C}_6\text{H}_5\text{O}_7^{2-} > \text{Cl}^- > \text{CO}_3^{2-} > \text{NO}_3^- > \text{SO}_4^{2-}$ .

#### II—Effect of Ammonium Molybdate on the Absorption Spectrum of Methylene Blue

*Ibid.*, 469–472

Addition of  $(\text{NH}_4)_6\text{Mo}_7\text{O}_24$  to the solution decreased the  $\alpha$ - and  $\beta$ -bands and increased  $R$ ; as the amount of molybdate added increased, a new band with a maximum at 580–590 m $\mu$ . appeared. This metachromatic action of Methylene Blue is quite similar to that of chondroitin-sulphuric acid.

**III—Effect of Salts on the Metachromasy of Methylene Blue by Ammonium Molybdate**

*Ibid.*, 473-478

The metachromasy of Methylene Blue by ammonium molybdate was greatest at pH 3.5, and completely disappeared below pH 1.8 and above 4.5. Low concentration ( $> 10^{-5}$  M.) of salts inhibited the metachromatic action of the molybdate. The order of inhibition at the same concentration for chlorides was:  $K^+ > Na^+ > Ba^{2+} > Mg^{2+} > Ca^{2+}$ .

**IV—Effect of Donaggio-positive Substances on the Metachromasy of Methylene Blue by Ammonium Molybdate**

*Ibid.*, 479-485

Substances positive to the Donaggio reaction (peptone 0.2%, gelatin 0.25%, macramine 0.01%) inhibited metachromasy of C.I. Basic Blue 9 by ammonium molybdate. Equilibrium-dialysis investigation proved that these substances combine with the molybdate and do not combine with the dye. C.O.C.

**Automatic Potentiometric Control in Indo-o-toluidine Production**

N. Y. Parashkevich, I. A. Vykhoedtsev, and B. D. Zolotov  
*Chim. prom.*, 242-244 (1956);  
*Chem. Abs.*, 51, 724 (10 Jan. 1957)

This sulphur dye intermediate is produced by neutralising the interaction product of *p*-nitrophenol and *o*-toluidine sulphate, the excess of  $NH_3$  after neutralisation being critical (0.2-0.4%  $NH_3$ ), because acidity will cause resinsification of the product and excess  $NH_3$  would lower the yield apart from being wasteful of  $NH_3$ . Potentiometric control using a quinhydrone electrode was applicable in titrating the  $NH_3$ , and a smooth Pt electrode was found to be satisfactory in the set-up. It works well under both bench and works conditions. C.O.C.

**Sulphur Dyes. I—Change of Colour during Preparation**

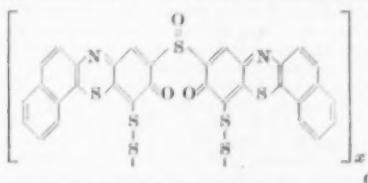
H.-Y. Lee and C.-S. Wu  
*Chemistry (Taiwan)*, 127-132 (1956);  
*Chem. Abs.*, 51, 1609 (25 Jan. 1957)

*p*-Nitrophenol (10 g.), 25% NaOH (42 ml.), and S (14 g.) were heated for 46 hr. at 115-120°C. Then 29% HCHO (4 ml.) was added, and the mixture heated for 94 hr. at 120-125°C. followed by addition of 52%  $Na_2S_2O_8$  (4 g.) and heating for 1 hr. to produce an olive dye. *o*-Nitrophenol similarly treated yielded a brownish-green dye. Neither 2:4-dinitrophenol nor picric acid, similarly treated, showed any alteration when H-CHO was added. C.O.C.

**Specific Sulphur Dyes. I—Indocarbon CLX**

N. Ono  
*J. Soc. Org. Synth. Chem. Japan*, 12, 466-472 (1954);  
*Chem. Abs.*, 51, 723 (10 Jan. 1957)

Indocarbon CLX is produced from *N*-*p*-hydroxyphenyl-2-naphthylamine and S. Its structure seems to be—

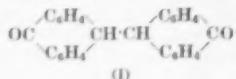


C.O.C.

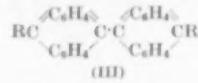
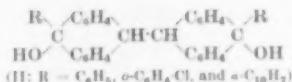
**Action of Grignard Reagents on Dianthrone-9-ylidene and Dianthrone-9-yl**

A. F. A. Ismail and Z. M. El-Shafei  
*J.C.S.*, 796-799 (Feb. 1957)

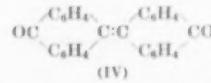
Dianthrone-9-yl (I) is converted by Grignard reagents into diols (II), except that benzylmagnesium chloride affords only the monoalcohol. II with acetic anhydride and acetic acid give acetates, although the di-*a*-naphthyl diol (II:  $R = a$ - $C_{10}H_7$ ) is thereby dehydrated to the hydrocarbon (III:  $R = a$ - $C_{10}H_7$ ). Dianthrone-9-ylidene (IV) is reduced by lithium aluminium hydride to 10:10'-dihydrodianthrone-9-ylidene.



(I)



(III)



(IV)

H.H.H.

**Anthraquinone Derivatives. XXVI—Hydrolysis of Anthraquinone-1:5-disulphonic Acid**

V. V. Kozlov

*J. Gen. Chem. U.S.S.R.*, 26, 2617-2622 (Sept. 1956)

Results on the hydrolysis of anthraquinone-1:5-disulphonic acid in absence and presence of Hg salts are very similar to those obtained for the 1:8-acid; see *J.S.D.C.*, 71, 622 (1955).

A.E.S.

**Polarographic Investigation of Lakes of Hydroxy-anthraquinones**

V. Mihajlo

*Univ. Microfilms (Ann Arbor, Mich.), Publn. No. 18081, 102 pp. (microfilm \$1.50; paper enlargement \$10.20)*

**Vapour Pressures of some Disperse Dyes**

R. S. Bradley, C. L. Bird, and F. Jones

*Nature*, 178, 998-999 (3 Nov. 1956)

Vapour pressures of 1-methylaminanthraquinone and 1- $\beta$ -hydroxyethylaminanthraquinone have been determined over the temperature ranges 110-130°C and 150-165°C, respectively. Values are given of the heat and standard entropy of sublimation and of  $a$  and  $b$  in the relationship—

$$\log_{10} p = \frac{a}{T} + b$$

where  $p$  is the vapour pressure and  $T$  the absolute temperature.

W.R.M.

**Vat Dyes. V—Long-chain Acylaminoanthraquinones**

R. D. Desai and R. N. Desai

*J. Indian Chem. Soc.*, 33, 559-560 (Aug. 1956)

Acylation of 1- and 2-aminoanthraquinones and mono-acylation of 1:4-, 1:5-, and 2:6-diaminoanthraquinones with lauryl, palmityl, and stearyl chlorides gave yellow-red compounds which would not vat, but which were soluble in vegetable oils.

C.H.R.

**Tautomeric Compounds. XXII—Mobility of the Hydrogens of the Methyl of Quinaldine**

A. E. Porai-Koshits and I. I. Chizhevskaya

*J. Gen. Chem. U.S.S.R.*, 26, 1950-1958 (July 1956)

Quinaldine condenses at its methyl group with the anhydrides of 1:4:5:8-naphthalene- and 3:4:9:10-perylene-tetracarboxylic acids with formation of vat dyes (I and II, respectively). On cotton, I gives a golden-yellow dyeing from a green vat and II a red dyeing from a dark-violet vat; the dyeings are of good fastness to washing and light. The sulphonation products of I and II are direct dyes. The structure of II (below) is confirmed by its formation in the alkaline fusion of the condensation product formed by quinaldine with naphthalic anhydride. The structure of I is analogous to that of II.



(II)

A.E.S.

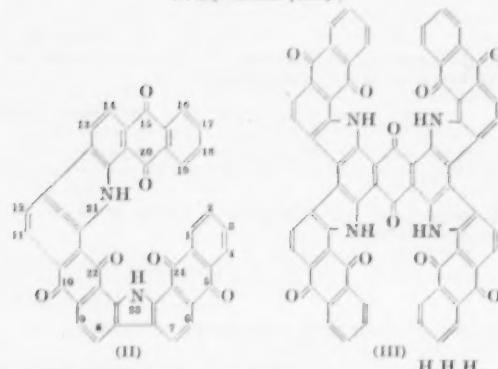
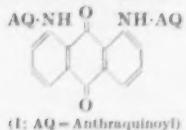
**Cyclisation of 1:8-Di- and 1:4:5:8-Tetra-( $\alpha$ -anthraquinonylaminoo)anthraquinone to Derivatives of Carbazole**

W. Bradley and P. N. Pandit

*J.C.S.*, 819-826 (Feb. 1957)

1:8-Di-( $\alpha$ -anthraquinonylaminoo)anthraquinone (I) when heated with  $TiCl_4$  or  $AlCl_3$  cyclises to II, two carbazole

nuclei being formed. Similarly, the 9:11-di-( $\alpha$ -anthraquinonylamino) deriv. of II gives a yellow substance, believed to be III, which differs from the greenish-brown product that results from like treatment of 1:4:5:8-tetra-( $\alpha$ -anthraquinonylamino)anthraquinone.



#### Vibrational and Electronic Spectra of Indigo (C.I. Vat Blue 1) and its Halogen Derivatives

D. N. Shigorin, N. S. Dokunikhin, and E. A. Gribova  
*Zhur. fiz. khim.*, **29**, 867-876 (1955);  
*Chem. Abs.*, **51**, 858 (25 Jan. 1957)

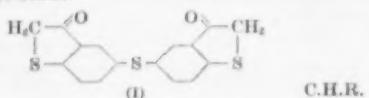
The spectrum of crystalline Indigo indicates presence of strong intramolecular hydrogen bonds. The frequency of the valency vibration of the NH group is 3275/cm. and of CO 1620/cm. In the vapours, the NH vibration frequency is 3405/cm., showing it to be greatly reduced by changes in the atomic valency state when affected by the neighbouring atoms. The electron displacement in the electron indigo spectrum by over 100 m $\mu$  is caused by the disturbance in the H bond, which affects the  $\pi$ -electron distribution density. Tetrahalogenated indigos form no intramolecular bonds in the crystalline state, presumably because of steric hindrance (the H atoms being shielded by the halogen atoms). A weak intramolecular NH...X bond may form between the NH group and halogens. The NH valency vibration frequency is 3385/cm. The vibration frequency of the free CO group in these compounds, 1650/cm., is formed in the improved absorption spectrum and coincides with the CO valency vibrations in thiindigo. The electronic absorption spectra in the tetrahalogenated indigos are the same in the solid and vapour states because of absence of intramolecular hydrogen bonds. The valence NH vibration bonds in Indigo, participating in the intramolecular H bond formation in the infrared absorption bands, are not only characterised by greater diffusion and displacement towards the longer wavelengths, but also by nearly tenfold greater intensity than in the tetrahalogenated indigos, which do not participate in formation of intramolecular H bonds.

C.O.C.

#### Indigoid Dyes—XX

P. C. Dutta and D. Mandal  
*J. Indian Chem. Soc.*, **33**, 812-814 (Nov. 1956)

The bishydroxythiophen compound (I) prepared from diphenylsulphide via the 4:4'-disulphonyl chloride has been condensed with  $\alpha$ -diketones such as isatin, acenaphthaquinone, acanthraquinone, and phenanthraquinone, to give pink-violet vat dyes which have only sparingly soluble leuco derivatives, and which are hypochromic in comparison with the corresponding compounds from diphenyl ether.



#### Fluorescent Brightening Agents

M. Hayashi and M. Okazaki  
*J. Assocn. Org. Synthet. Chem. (Japan)*, **13**, 458-470 (1955);  
*Chem. Abs.*, **51**, 725 (10 Jan. 1957)  
Review, 132 references.

C.O.C.

#### Colour and Constitution. I—Effect of Methyl Substitution on the Ultraviolet Spectra of Alternant Hydrocarbons

D. Peters  
*J.C.S.*, 646-651 (Feb. 1957)

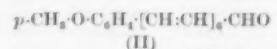
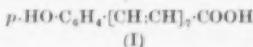
The Hückel L.C.A.O. (linear combination of atomic orbitals) molecular-orbital theory is shown to provide a satisfactory quantitative account of the bathochromic shifts observed in the ultraviolet spectrum when a methyl group is introduced into polycyclic aromatic hydrocarbons containing no odd-numbered rings. The effect on this spectrum of steric hindrance to coplanarity of the methyl group and the aromatic ring system is discussed.

H.H.H.

#### Polyenes. V—Synthesis of Cortisalin

D. Marshall and M. C. Whiting  
*J.C.S.*, 537-542 (Feb. 1957)

The synthesis of cortisalin (I) has been accomplished by condensation of the aldehyde II with malonic acid, decarboxylation of the product, subsequent esterification with diazomethane, and then demethylation with AlBr<sub>3</sub>. The resulting epd. is essentially identical with the natural pigment



H.H.H.

#### Synthetic Carotenoids as Food Dyes

O. Isler, H. Lindlar, M. Montaron, R. Rüegg, G. Saucy, and P. Zeller  
*Mitt. Lebensm. Hyg.*, **47**, 183-189 (1956);  
*Chem. Abs.*, **51**, 1493 (25 Jan. 1957)

Description of the synthesis of some carotenoids, e.g.  $\beta$ -carotene (C.I. 75130),  $\beta$ -C<sub>40</sub>-diol, lycopene (C.I. 75125), and zeaxanthene.

C.O.C.

#### Use, Study, and Production of Caramel (C.I. Natural Brown 10)

H. Roederer

*Stärke*, **7**, 205-208 (1955);  
*Chem. Abs.*, **51**, 634 (10 Jan. 1957)

Absorption spectra of caramel colours (C.I. Natural Brown 10) depend on dilution and pH, so that tests for colouring powers must be made under standard conditions. Because various types contain positively and negatively charged colloids, tests must be made for compatibility with the material to be coloured. A test for the isoelectric point of colloids < 3 was made by mixing 0.05% gelatin solution at pH 1, 1.5, 2, 2.5, and 3 with 0.5% caramel solution of the same pH and examining after 12 hr. for formation of precipitate. Precipitates form at pH values below the isoelectric point. When 0.2% caramel is treated with 0.5% tannin, formation of a precipitate indicates presence of a positive colloid. The stability of caramel to acid is tested by boiling 50 ml. of the 1% colour diluted with 250 ml. of water with 7.5 ml. of conc. HCl for 5 min.; after standing for 24 hr. at room temperature it is examined for turbidity; if clear, it is boiled for 30 min. and re-examined. The chemistry of the formation of caramel is discussed.

C.O.C.

#### Spectrophotometric Studies of the Colour Changes of Murexide (C.I. 56085°) in Acid Solutions

N. A. Ramajah, S. L. Gupta, and Vishnu  
*J. Sci. Ind. Research (India)*, **15B**, (6), 328-330 (1956);  
*Chem. Abs.*, **51**, 81 (10 Jan. 1957)

The absorption spectra for 0.125 and 0.625 mM. murexide (C.I. 56085°) at pH 6 gave maximum absorption at wavelength 530 m $\mu$ . At pH > 6 the colour appeared permanent, while for pH < 6 absorbance decreased progressively with time. The time for half decomposition showed the reaction to be of the first order with  $K_1 = 7.5 \times 10^{-6}$  min.<sup>-1</sup> for 0.125 mM.

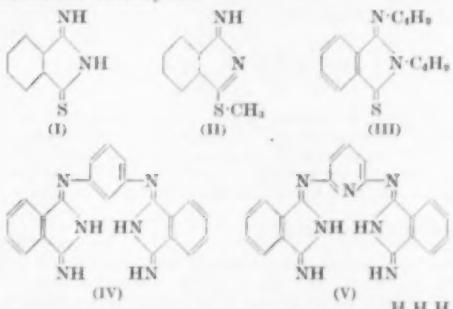
C.O.C.

**Heterocyclic Imines and Amines. VIII—Identification of "o-Cyanothiobenzamide" as 1-Imino-3-thioisoindoline, and its Conversion with Amines into Macrocycles and Intermediates**

M. E. Baguley and J. A. Elvidge

J.C.S., 709–719 (Feb. 1957)

The primary product from phthalonitrile and  $H_2S$  is not o-cyanothiobenzamide (as reported by Drew and Kelly, J.C.S., 630 (1941)), but is 1-imino-3-thioisoindoline (I). The fine structure of I is discussed. Condensation of I and its *S*-methyl deriv. (II) has been studied briefly; reaction can occur at one or both of their exocyclic functional groups, but with butylamine I gives 2-butyl-1-butylimino-3-thioisoindoline (III), both the cyclic and the exocyclic imino groups being displaced. With *m*-phenylenediamine and 2:6-diaminopyridine, three-unit products (IV and V) are obtainable; these have rather unreactive terminal functional groups and form symmetrical macrocycles.

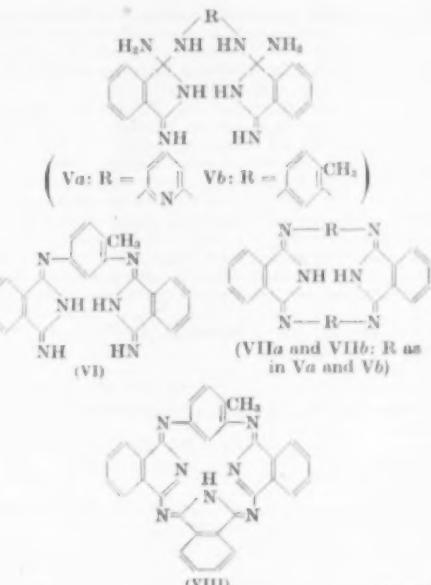
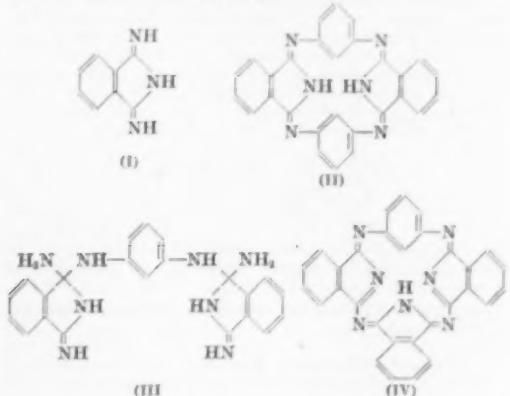


**Conjugated Macrocycles. XXVIII—Adducts from Di-iminoisoindoline and Arylene-*m*-diamines, and a New Type of Cross-conjugated Macrocycle with Three-quarters of the Chromophore of Phthalocyanine**

J. A. Elvidge and J. H. Golden

J.C.S., 700–709 (Feb. 1957)

Yellow adducts are formed from 2 mol. of di-iminoisoindoline (I) with 1 mol. of the diamines, *m*-phenylenediamine, 2:6-diaminopyridine, and 2:4-diaminotoluene. The first adduct (III) in boiling butanol gives a mixture of the known benzene macrocycle II and a new red macrocycle (IV), which has three "isoindole" units in the mol. The macrocycles II and IV are obtained separately by condensation of the adduct with *m*-phenylenediamine and with di-iminoisoindoline. The adducts Va and Vb respectively yield, under various conditions, only the known 2:6-pyridine macrocycle VIIa and a related toluene macrocycle (VIIb). However, the product VI, derived from the condensation of 2 mol. of di-iminoisoindoline with one of diaminotoluene, condenses with di-iminoisoindolines to yield the homologous red macrocycle VIII. Structures and stereochemistry are discussed and light absorptions given. Metal-containing products from IV and VIII are described.



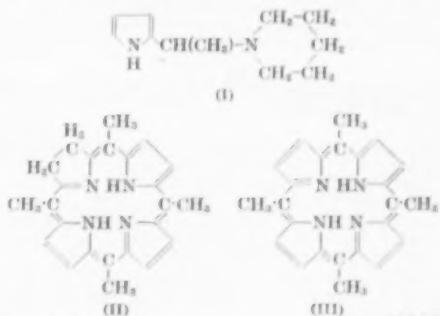
H.H.H.

**Synthesis of *meso*Tetramethylchlorin**

U. Eisner

J.C.S., 854–858 (Feb. 1957)

A description is given of a three-stage preparation from pyrrole of the Mannich base (I), and from it of the syntheses of *meso*tetramethyl-chlorin (II) and -porphin (III).



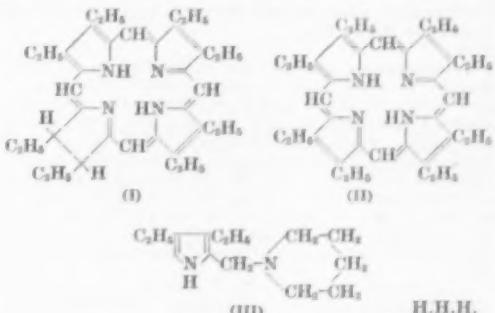
H.H.H.

**Chlorophyll and Related Compounds. VI—Synthesis of Octaethylchlorin**

U. Eisner, A. Lichtarowicz, and R. P. Linstead

J.C.S., 733–739 (Feb. 1957)

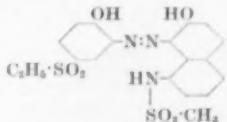
A five-stage synthesis of 3:4-diethylpyrrole is reported, and, from it, octaethyl-chlorin (I) and -porphin (II) have been prepared in good yield by way of the Mannich base (III); the interconversion of these pigments is described.



H.H.H.



coupled with diazotised 2-amino-4-(alkylsulphonyl)phenols; the Cr complexes of the resulting monoazo compounds dye wool, nylon, etc. grey from neutral or weakly acid baths, and are more soluble than the similar dyes of *BP* 730,036 (*J.S.D.C.*, **71**, 476 (1955)) derived from *N*-CO-Alk derivatives of I. Thus treatment of I with methanesulphonyl chloride gives the *N*-methylsulphonyl derivative, which is coupled with diazotised 2-amino-4-(ethylsulphonyl)phenol to give—

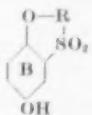


Boiling with aq.  $K_2Cr_2O_7$  in presence of  $NaOH$  and glucose gives the Cr complex. E.S.

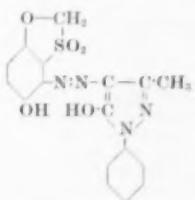
**Metallisable Mono- and Dis-azo Dyes having a Cyclic Ether-sulphone Group**

FBy *BP* 766,554

The cyclic ether-sulphones of *BP* 637,404



( $R = CH_3$ ,  $CH_2CH_3$ , or *o*-arylene; B = benzene or naphthalene nucleus) are converted by e.g. nitration and reduction into amino compounds, which may be diazotised and coupled with *o*-coupling hydroxy-compounds to give metallisable azo dyes. Similar dyes are obtained by using the cyclic ether-sulphones as coupling components with suitable diazo compounds. Thus aminohydroquinone methylene sulphone ether (4-amino-5-hydroxybenzoxathiol-8-dioxide) is diazotised and coupled with 3-methyl-1-phenyl-5-pyrazolone in presence of  $Na_2CO_3$  to give

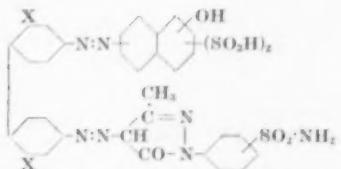


Boiling with a basic chromium sulphate soln. in presence of  $NaOH$  and oxalic acid gives the Cr complex, which dyes wool bordeaux from a weakly acid bath. E.S.

**Orange and Red Disazo Acid Dyes**

Fran *BP* 767,430

Disazo dyes—



(X = Hal, Alk, or O Alk) give bright oranges and red on wool, of better fastness to light than the similar dyes of *BP* 481,477 (*J.S.D.C.*, **54**, 337 (1938)) which have an  $SO_2H$  group in place of the  $SO_2NH_2$  group. Thus tetrazoised 2,2'-dichlorobenzidine is coupled first with 1 mol. of 1-naphthol-3,6-disulphonic acid and then 1 mol. of 3-methyl-1-*m*-sulphonylphenyl-5-pyrazolone is added. The disazo dye so formed dyes wool bright scarlet without staining any cellulose present. E.S.

**Disazo Direct Dyes for Aftercoppering**

ICI *BP* 768,681

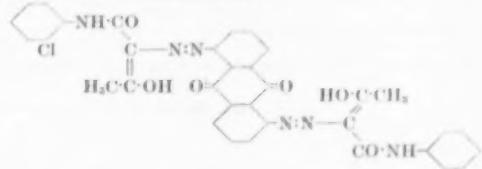
Aminomonooazo compounds obtained by coupling a diazotised primary amine, having OH, COOH, or  $OC_2H_5$ ,

$COOH$  *ortho* to the amino group, with *N*-*m*(or *p*)-amino-benzoyl-J acid are diazotised and coupled with an hydroxy-indazole, a 4-hydroxybenzothiazole, 4-hydroxyacridine, or 1-(5'(or 6')-indazyl)-3-methyl-5-pyrazolone, to give disazo direct dyes whose brightness is little affected by after-coppering. Thus, the aminomonooazo dye 2-amino-6-chlorophenol-4-sulphonic acid  $\rightarrow$  *N*-*m*-aminobenzoyl-J acid is diazotised and coupled under alkaline conditions with 4-hydroxybenzothiazole to give a red direct dye. Preparations of the heterocyclic coupling components listed are outlined. E.S.

**Anthraquinone Disazo Pigments**

Ciba

1:5, 1:6, 1:7, 2:6, and 2:7-Diaminoanthraquinone or halogen derivatives thereof are tetrazotised and coupled, preferably under weakly acid conditions, with *ortho*-coupling phenolic or enolic compounds to give insoluble pigments. Thus 1:5-diaminoanthraquinone is tetrazotised in nitrosylsulphuric acid, and the tetrazo-compound isolated as a moist filter-cake. It is coupled with a suspension in dil. acetic acid and sodium acetate of *o*-chloroacetoneacetanilide to give



which colours polyvinyl chloride pure yellow of good fastness to migration and light. E.S.

**Azoic Reds**

FH

Azoic dyeings and prints produced from diazotised 4-amino-2,5-dimethoxy-3'(or 4')-nitroazobenzene coupled on the fibre with *N*-acetoacetyl-4-chloro-2,5-dimethoxy-aniline are bright scarlets and clarettes, faster to light than the similar hues given by these diazo compounds coupled with *NN*-bisacetoxycetyl-*o*-toluidine. E.S.

**Insoluble Azo Pigments—Improvement in Properties by Coupling in Presence of Emulsified Oil**

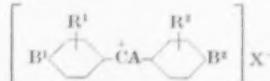
FH

By coupling in presence of an emulsified oil, insoluble azo pigments can be prepared in a soft, finely-divided form, containing  $> 5\%$  oil. Thus, a hydrocarbon fraction from a Fischer-Tropisch synthesis of b.p. 220–320°C. is treated with  $SO_3$  and Cl until half has been converted into sulphonochlorides. Treatment with  $NH_3$  gives the sulphon-amides, which are condensed with chloroacetic acid. Neutralisation with e.g.  $NaOH$  then gives a product containing unchanged hydrocarbons, and sodium alkyl-sulphonamidoacetate, as well as small amounts of sodium alkyl sulphonates and alkylsulphonamides, which is mixed with spindle oil and water to give an emulsion. A mixture of this emulsion, chalk, and 3-carboxy-1-phenyl-5-pyrazolone is warmed to 50°C. and a tetrazo soln. from 3:3'-dichlorobenzidine is run in. When coupling is complete, acid is added and a further quantity of the emulsion before boiling and filtering off. E.S.

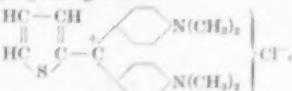
**Hetero-diphenyl Dyes**

Gevaert

*Dyes of formula—* *BP* 769,749



(A = N and/or S containing nucleus; B<sup>1</sup> = alkoxy or subst. amino group which may contain a solubilising group; B<sup>2</sup> = H or B'; R<sup>1</sup> and R<sup>2</sup> = solubilising group; X = anion, e.g. the green

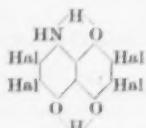


are very good anti-halation and filter dyes. C.O.C.

**Improved Method for making Halogenated Naphthaquinoneimines—Disperse Dyes**

BP 767,754

2:3-Dihalogeno-1:4-naphthaquinones which may have Hal in the 6- and/or 7-positions are nitrated to give the 5- $\text{NO}_2$  derivatives. Treatment of solutions of these compounds in 100%  $\text{H}_2\text{SO}_4$  at 40°C. with 8 and fuming  $\text{H}_2\text{SO}_4$  followed by precipitation on to ice, filtration and washing gives—

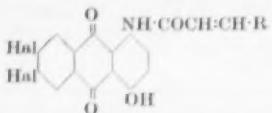


The products are blue to violet disperse dyes giving dyeings of excellent light fastness on Terylene. The present process is much more economical than that of *BP* 629,706 (J.S.D.C., 66, 156 (1950)), which uses 1:5-dinitronaphthalene as its starting material. E.T.

**Anthraquinone Disperse Dyes**

BP 765,923

Orange or reddish orange disperse dyes of formula—

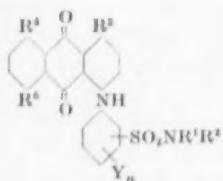


are made by reacting 1-amino-4-hydroxyanthraquinone or its 6- and/or 7-halogen derivatives with a functional derivative of an unsaturated acid,  $\text{HOOC-CH:CH-R}$  ( $\text{R} = \text{H, CH}_2$ , vinyl, propenyl, phenyl, chlorophenyl, carbomethoxy, carbethoxy, carbopropoxy or carbobutoxy). An organic medium, e.g. benzene, chlorobenzene and an acid binding agent are used at 60 to 150°C. After acid pasting the dyes are dispersed and produce dyeings of high fastness to washing and light. E.T.

**Anthraquinone Dyes**

General Aniline

Dyes of formula—



$\text{R}^1 = \text{Alk, hydroxyalkyl, hydroxyalkoxyalkyl, hydroxy-polyalkoxyalkyl or cyanoalkyl; R}^2 = \text{H, Alk, hydroxy-alkyl, hydroxyalkoxyalkyl, hydroxypolyalkoxyalkyl or cyanoalkyl; R}^1 + \text{R}^2$  may =

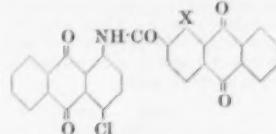


$\text{R}^1$ ,  $\text{R}^2$  and  $\text{R}^3 = \text{H, OH, NH}_2$ , alkylamino, arylamino or acrylamino;  $\text{Y} = \text{H, Cl, NO}_2$  or  $-\text{SO}_2\text{NR}^1\text{R}^2$ ;  $n = 0, 1$  or  $2$ ) have much better fastness to light and gas fume fading than have similar dyes not containing a sulphamyl group, these properties being particularly marked in pastel dyeings on cellulose acetate. Their hues range from red to bluish green and are always redder than the corresponding dye containing no sulphamyl group, e.g. 1-anilino-4-hydroxyanthraquinone is a bluish violet which on introduction of a sulphonamide group into the anilino nucleus becomes reddish violet. Some of these dyes, particularly when  $\text{R}^1$  and  $\text{R}^2 = \text{Alk}$ , are useful as plastic colorants because of their good fastness to light and brightness. Others may be used as vat dyes and yet others as solvent dyes. Five different methods of making them illustrated by 30 examples are described. C.O.C.

**Anthraquinone Vat Dyes**

BASF

Red vat dyes with good levelling power and light fastness—



( $\text{X} = \text{NH}_2$  or  $\text{NO}_2$ ) are made by condensing 1-amino-4-chloroanthraquinone with a 1- $\text{NH}_2$ , 1- $\text{NO}_2$  or 1-halogeno-anthraquinone-2-carboxylic acid halide. The 1- $\text{NO}_2$  or 1-halogeno-group is finally replaced by a 1- $\text{NH}_2$  group by treatment with  $\text{NH}_3$ . Thus, a mixture of 1- $\text{NH}_2$ -4-Cl-anthraquinone, 1- $\text{NO}_2$  anthraquinone-2-carboxylic acid chloride and anhydrous nitrobenzene is heated at 130-140°C. until condensation is complete. The mixture is then treated with ammonia gas at 180°C. until the nitro group has been entirely replaced by the amino group. E.T.

**leuco-Esters of Anthraquinone Vat Dyes**

DH

BP 766,638

Modification of *BP* 719,621 (J.S.D.C., 71, 157 (1955)) and *BP* 745,365 (J.S.D.C., 72, 394 (1956)). Vat dyes whose leuco-compounds are difficult to esterify, e.g. certain 4-, 5- or 8-subst. 1-arylaminoanthraquinones, anthraquinone-carbazoles and anthrimides, are treated with chlorosulphonic acid in a mixture of a dialkylformamide and diethylcyclohexylamine and/or a diethyl-(monomethylcyclohexyl)-amine in presence of finely divided Fe, Co or Cu.

BP 767,580

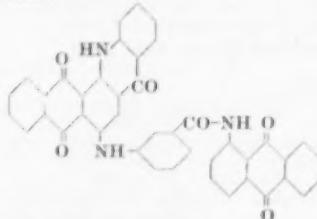
Modification of *BP* 719,621 and *BP* 745,365. A mixture of 2-methyl-5-ethylpyridine with diethylcyclohexylamine and/or diethyl-(monomethylcyclohexyl)-amine replaces the  $\alpha$ -picoline/diethylcyclohexylamine mixture and the diethylcyclohexylamine/diethyl-(monomethylcyclohexyl)-amine as the medium when treating leuco-vat dyes with chlorosulphonic acid in presence of Fe, Co or Cu. E.T.

**Anthraquinone Vat Dyes**

CFM

BP 767,004

Yellowish-green vat dyes of very good fastness properties are made by condensing 2-amino-3:4-phthaloylacriderone or its 5-, 6-, 7- or 8-chloro or bromo-derivative with a 1-(3'-halogenobenzoylamino)anthraquinone. Thus, 2-amino-3:4-phthaloylacriderone and 1-(3'-bromobenzoyl-amino)-anthraquinone are heated in nitrobenzene for 12 hr. at 200°C. in presence of sodium and copper acetates and copper powder. After filtration, the product is washed successively with nitrobenzene, methanol and hot water. It has the formula—



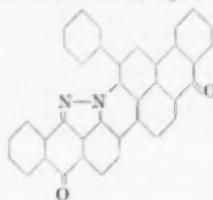
E.T.

**Halogen-containing Vat Dyes**

FH

BP 766,345

Greenish-blue vat dyes of good fastness to washing, light and chlorine are obtained by halogenation in aqueous suspension at 20-50°C. of a Bz-2-phenyl-Bz-1-Py-1'-2:2'-benzanthrone-pyrazole-anthrone, e.g.—





**Water Transport Mechanisms in Textile Materials.**  
**II—Capillary-type Penetration in Yarns and Fabrics**  
 N. R. S. Hollies, M. M. Kaesinger, B. S. Watson, and  
 H. Bogaty

*Text. Research J.*, 27, 8-13 (Jan. 1957)

The data for transport of water along strips of fabric (cotton, synthetic fibres, and wool) are shown to be expressible as—

$$s^2 = k_s(t - t_0)$$

where  $s$  is the distance travelled in time  $t$ ,  $k_s$  is the distance water-transport rate constant, and  $t_0$ , a constant for a particular fabric, represents an initial surface wetting before the main capillary process begins. The constant,  $t_0$ , obtained by extrapolation to zero distance, is shown to be correlated with the time required for a drop of water to be absorbed by the fabric. Values of  $k_{so}$ , the mass water-transport rate constant, were determined experimentally on a range of fabrics, and the results were in good agreement with  $k_m$  values calculated from the equation—

$$k_m = m_w^2 k_s$$

where  $m_w$  is the water-holding capacity per unit area at saturation. It is suggested that the time required for absorption of a single drop of water might serve as a simple means for assessing fibre arrangement in the yarns of fabrics. The relation of fibre arrangement to other properties of fabrics is discussed. J.C.F.

**Spontaneous Heating and Ignition of Wet Cotton Bales**

P. C. Bowes

*F.R. Note 126R/1954* (D.S.I.R.):

*J. Textile Inst.*, 47, p 1024-P 1025 (Dec. 1956)

The available information on the spontaneous heating and ignition of wet cotton has been reviewed by the Joint Fire Research Organisation of the Department of Scientific and Industrial Research and the Fire Offices' Committee. There is no evidence that bales of clean cotton, wet or dry, are liable to spontaneous ignition. Cotton, wet or dry, may be ignited by impact or friction of steel bands. Cotton "fire-packed" (containing locks ignited in the gin) may smoulder for weeks internally, and cotton contaminated by oxidising oils can ignite spontaneously. Also, cotton salvaged from fires is a dangerous fire risk unless carefully "picked": it may contain a smouldering lock or it may be contaminated by some oxidisable material. However, wet cotton, although it will warm up spontaneously and deteriorate, is not, if clean, a fire risk. Consequently the Ministry of Transport and Civil Aviation's requirements for the carriage of wet cotton by sea have been revised. Metal-lined or hermetically sealed boxes are no longer required. Wet or dry, clean cotton may be shipped in bulk if securely baled. Wet and dry bales must not be stowed together. Shipment of cotton salvaged from fires requires the approval of the Ministry. P.T.S.

**Examination of Soluble Non-Cellulosic Constituents of Flax**

K. C. Menzel

*Faserforsch. und Textiltech.*, 8, 14-21 (Jan. 1957)

Non-cellulosic substances in retted and non-retted flax are examined and classified according to their solubility in various liquids. W.R.M.

**Acetone from Simple Sugars**

P. K. Saha, A. K. Mazumdar, and P. B. Sarkar

*Text. Research J.*, 27, 85 (Jan. 1957)

As a preliminary to an attempt to determine rhamnose in the presence of other sugars from the acetone which it liberates on distillation with acid, the authors examined the behaviour of arabinose, xylose, and glucose on distillation with (a) 12% HCl and (b) 2% NaOH. In all cases acetone could be detected in the distillate. Acetone was present in distillates of jute with (a); its formation is probably preceded by hydrolysis of the cellulose or hemicellulose to simple sugars. On alkali distillation the fibre yields practically no acetone. J.C.F.

**Reduction of Static Electricity by incorporating Viscose Rayon containing Carbon**

J. Boyd and D. Bulgin

*J. Textile Inst.*, 48, p 66-P 99 (Jan. 1957)

Static electricity generated on clothing and other textile material can give rise to small sparks which are dangerous in explosive atmospheres, particularly in

hospital operating theatres, where there is sometimes an explosive mixture of oxygen and anaesthetics. For this reason only cotton and viscose rayon can be used, and a high R.H. (55-60%) is necessary to prevent accumulation of static charges. These charges can be eliminated by bulk conduction through a fabric, by surface conduction, or by ionic conduction in an ionising atmosphere. A viscose rayon yarn has been made with 30% of finely divided carbon (acetylene, Shawinigan black) incorporated before extrusion, and if this is woven into a viscose rayon fabric with one thread per cm. of the warp and weft, bulk conduction along these threads prevents the accumulation of static charges, and makes a high R.H. unnecessary. The physical properties of this viscose rayon yarn with carbon incorporated are described, and the effects of various factors (temp., extension, load, applied voltage, carbon content, and humidity) on its conductivity are given.

P.T.S.

**New Method for preparing Cellulose Thiourethans**

A. L. Allewell and W. R. Watt

*Ind. Eng. Chem.*, 49, 68-70 (Jan. 1957)

Alkali-soluble cellulose derivatives are formed by the reaction of zinc cellulose xanthate with primary amines in neutral aqueous media at room temperature. They are soft, white, fibrous materials containing N and S and are believed to be cellulose thiourethans. W.K.R.

**Cellulose Phenylthiourethan Fibres**

A. L. Allewell

*Ind. Eng. Chem.*, 49, 71-78 (Jan. 1957)

The physical and chemical properties of fibres spun from cellulose phenylthiourethan (1 thiourethan group per 3 anhydroglucoside units) are described and compared with those of viscose rayon, cellulose acetate, and wool. The fibre can be dyed with neutral and weakly acid dyes, but has only limited affinity for other types of dye. W.K.R.

**Investigations on Suint**

A. J. Farnworth

*Australian J. Applied Sci.*, 7, 233-241 (1956):

*J. Amer. Leather Chem. Assocn.*, 52, 104 (Feb. 1957)

Suint is a water-soluble material present in wool in variable amount (2-9%). It contains about 1-3% Na and 26-1% K, combined mostly with water-soluble organic acids. Fatty acids are present in minor amounts only.

C.J.W.H.

**Analysis of the Different Morphological Components of Wool by Chromatography and Electrophoresis**

J. Dermot and M. Leveau

*Bull. Inst. Text. France*, (64), 7-14 (Dec. 1956)

Total hydrolysates of (a) orthocortex, (b) paracortex, (c) cuticular material, isolated as described previously (Leveau, *ibid.*, (63), 91 (1956)), and (d) the material removed from the fibre during the initial mild hydrolysis necessary for the isolation of (a)-(c) have been analysed by two-dimensional paper chromatography and paper electrophoresis. Hydrolysates (a) and (b) differ qualitatively by the presence in (b) of an unidentified ninhydrin-reactive substance which is thought to contain sulphur; (c) has a low cystine content, but contains cysteic acid. The composition of (d) is similar to that of (c). J.C.F.

**Observations relating to Cortical Asymmetry in Wool**

A. R. Haly

*Text. Research J.*, 27, 82-84 (Jan. 1957)

Ortho- and para-cortex can be distinguished in untreated, crimped fibres under ordinary conditions of transmitted-light microscopy. The paracortex is characterised by many striations of length 20-30  $\mu$  parallel to the fibre axis. Differentiation is most pronounced in water-saturated fibres. Examination of untreated merino fibres by this technique showed that the two cortical segments are not wound around each other in the same sense from end to end of the fibre. Crimpless wool from copper-deficient sheep showed no cortical asymmetry by this technique, nor on staining with Methylene Blue. Segmentation could be distinguished, however, when this wool was stained with Coomassie Violet, or treated with alcoholic KOH, which attacks the orthocortex preferentially. Observations on pigmented samples from copper-deficient "black" merino sheep are also reported. J.C.F.

**Plasticity of Wool. III—Physical and Chemical Causes of Variation**

P. L. le Roux and J. B. Speakman

*Text. Research J.*, **27**, 1–7 (Jan. 1957)

Among fibres from a single lock of wool, high plasticity is associated with—(a) a high degree of swelling in water and in formic acid; (b) a high proportion of amorphous material (as measured by exchange with  $D_2O$ ); and (c) a high content of bulky tyrosine side-chains. Cystine content does not appear to be directly related to plasticity. The expert assessment of the quality of wools is shown to be influenced by the plasticity of the fibres and not by dimensional characteristics alone.

J.C.F.

**Supercontraction of Wool treated with Nitrous Acid**

C. S. Whewell and T. M. Menon

*J. Textile Inst.*, **47**, T 652–T 653 (Dec. 1956)

Wool treated in Van Slyke reagent (nitrous acid) shows diminished supercontraction in subsequent treatments with (a) boiling 30% phenol, (b) 85% formamide at 114°C., or (c) boiling water (fibre extended 1 min., then released). This suggests the formation of cross-linkages in nitrous acid, as has been noticed in the parallel case of silk (C. J. Cadwallader and S. G. Smith, *ibid.*, **47**, T 489 (1956)). An experiment is described showing the formation in wool of cross-linkages involving metal atoms when wool is treated with Van Slyke reagent in the presence of copper sulphate.

P.T.S.

**Dielectric Properties of Wool-Water Systems. II—26,000 megacycles**

J. J. Windle and T. M. Shaw

*J. Chem. Phys.*, **25**, 435–439 (1956);  
*Chem. Abs.*, **51**, 867 (25 Jan. 1957)

A theory is advanced supported by experimental data according to which the water sorbed by wool consists of three distinct molecular species—(1) localised water irrationally bound to polar sites in the wool, (2) mobile water with bulk liquid properties, and (3) intermediate water with a potential energy of absorption lying between those for localised and mobile water.

C.O.C.

**Structure of Polyamide Fibres. VIII—Heats of Solution of Crystalline and Amorphous Modifications of 6-Nylon**

N. V. Mikhailov and E. Z. Fainberg

*Colloid J. U.S.S.R.*, **18**, 315–320 (May–June 1956)

Comparisons are made between two samples of 6-nylon monofil—an amorphous sample (I) prepared by spinning into acetone + solid  $CO_2$  at  $-78^\circ C$ . and a crystalline sample (II) prepared by spinning into oil at  $+180^\circ C$ . and extracting oil with  $CCl_4$ . I and II are allowed to sorb various amounts of formic acid vapour, and integral heats of soln. of the products in formic acid are then determined (cf. *J.S.D.C.*, **72**, 456 (1956)). The integral heats of soln. of pure dry I and II are 17.4 and 6.1 cal./g. respectively, and, as the initial formic acid contents of the samples increase, the heats of soln. diminish and become negative, and the difference between the values for I and II diminishes and becomes zero at a negative heat of soln. This point marks the beginning of a region in which I and II have the same const. heat of soln. over a wide range of initial formic acid contents. When these results are expressed in the form of differential heats of soln.  $q$ , it is found that for each modification there are three regions of const.  $q$  and the values of  $q$  for these regions are almost the same for each modification ( $\sim 5000$ ,  $\sim 1500$ , and 0.0 cal. per mole of formic acid for low, moderate, and high initial formic acid contents respectively). This indicates the solvation of three types of bonds, all of which are present in each modification, but in different proportions. The implications of the results are discussed at length. It is concluded that a main distinguishing feature of the arrangement of polar groups in the crystalline modification is the predominance of hydrogen bonding by the "twinning" of *cis*-NH-CO groups.

A.E.S.

**Structure of Polyamide Copolymers and Mixtures**

N. V. Mikhailov and V. O. Klesman

*Colloid J. U.S.S.R.*, **18**, 456–460 (July–Aug. 1956)

With the aid of X-ray and thermographic analysis, comparisons are made between copolymers prepared from mixtures of 6- and 6,6-nylon monomers and the products obtained from melts of mixtures of 6- and 6,6-nylon

polymers. In the latter case, owing to chemical reaction between the components, the properties of the products and of the fibres prepared from them depend on the time of heating and are eventually very similar to those of the corresponding copolymers.

A.E.S.

**Properties and Possibilities of Polyvinyl Alcohol Fibres**

B. C. M. Dorset

*Text. Manuf.*, **82**, 636–643 (Dec. 1956)

**Black Chrysotile Asbestos and its Change to Brightly Coloured Chrysotile Asbestos**

G. N. Vertushkov and P. Y. Yarosh

*Zapiski Vsesoyuz. Mineralog. Obshchestva*, **85**, 224–228 (1956);  
*Chem. Abs.*, **51**, 959 (25 Jan. 1957)

Asbestos from the Bazhenovo deposits has a peculiar spotty occurrence of black or bluish-black chrysotile in the ordinary nearly colourless or greyish mineral, with transitions from the black to greenish or golden varieties. Under the microscope the black variety is often completely opaque. On calcination it becomes golden or dark grey and highly brittle. The black variety contains 0.70%  $FeO$  and 1.29%  $Fe_2O_3$ ; the corresponding colourless variety contains 0.04%  $FeO$  and 1.5%  $Fe_2O_3$ , the other constituents being the same as in the black variety.  $Aq. H_2O_2$ ,  $HNO_3$ , or  $(NH_4)_2S_2O_8$  bleaches the black variety in 20–40 hr., whereas  $aq. KMnO_4$ ,  $NaNO_3$ , or  $K_2Cr_2O_7$  does not. The changes caused by  $H_2O_2$  start from the free ends of the fibres and progress to the cores. The possibility of improving the flexibility of natural chrysotile asbestos by treatment with 30%  $aq. H_2O_2$  is technologically important.

C.O.C.

**PATENTS**

**Delustrated Nylon Filaments**

DuP

*BP* 767,897

Use, as the delustrant, of  $TiO_2$  which has had an active oxide (hydrated oxide and/or oxide) of cerium chemically deposited on it, without subsequent calcination, yields filaments of much greater resistance to degradation by light compared with those delustrated with ordinary  $TiO_2$ .

C.O.C.

**Pigmented Terylene**

ICI

*BP* 766,849

In making poly(methylene terephthalate), pigments or delustrants are added to the polymer-forming reactants as aqueous dispersions, without any deleterious effect on the resulting polyester.

W.G.C.

**Polyester Fibres**

ICI

*BP* 766,347

Fibres which can be dyed with disperse dyes without use of special techniques can be spun from polymers having the recurring unit  $-\text{CH}_2-\text{C}(\text{CH}_3)_2\text{CO}-\text{O}-$ , prepared by polymerising *aa*-dimethyl- $\beta$ -propiolactone.

W.G.C.

**Acrylic Copolymers having Affinity for Acid Dyes**

ICI

*BP* 766,534

Fibres having affinity for acid dyes can be spun from copolymers of acrylonitrile, a vinyl monomer and a derivative of an  $\alpha\beta$ -unsaturated carboxylic acid containing a quaternary nitrogenous radical as substituent in the carboxylic group, e.g. the quaternary aminononylamide of an acrylic acid.

W.G.C.

**Multifilament Polystyrene Yarns**

Dow Chemical Co.

*BP* 766,725

A multifilament yarn is made by extruding a molten polystyrene composition, cooling, and stretching, and then flexing or twisting the monofilament to cause longitudinal rupture or splitting into a number of long continuous filaments with little or no transverse rupture of the fibres. A composition suitable for this process contains 80–98% polystyrene and 20–2% of a ternary polymer of styrene (35 parts), acrylonitrile (30) and *a*-methyl styrene (35).

W.G.C.

**Moisture Relations of Cellulose. III—Sorption Hysteresis and the Effect of Temperature (XI p. 234)**

**High-intensity Flash Irradiation of Polymers (XIII p. 235)**

Determination of the Crystallinity of Cotton Fibre by the Iodine-absorption Method (XIV p. 236)

## VII—DESIZING; SCOURING; CARBONISING; BLEACHING

### Rôle of Interfacial Electrical Conditions in Detergency

K. Durham

*J. Appl. Chem.*, **6**, 153–161 (April 1956)

An attempt is made to analyse theoretically the rôle of electrical effects in detergency by application of concepts found useful in the study of lyophobic colloids. The analysis is restricted to consideration of lyophobic systems containing particulate soils.

L.T.W.

### Influence of Humidity and Temperature on the Stability of Bleaching Powder

H. C. Bijawat and P. K. Sarda

*J. Appl. Chem.*, **6**, 60–67 (Feb. 1956)

High humidity is shown to be the major cause of instability of bleaching powder, and empirical equations are developed which relate stability to relative humidity and amount of water absorbed to time of exposure. Rise in temp. above 40°C. is shown to contribute markedly to instability even at low humidities.

L.T.W.

## PATENTS

### Continuous Cleansing of Sheets or Webs of Fibrous Materials

J. Dungler

BP 764,483

The sheet or web is impregnated with a liquid which reacts with an impurity in the fibres. The impregnated material is continuously passed in open width through a stove and is then washed. The stove has a drying atmosphere and means for heating the cold wet material entering it, so that the liquid in the material is very rapidly heated and evaporated as it passes through the stove. The process is applicable to desizing, bleaching, scouring of cotton cloths, etc.

C.O.C.

### Bleaching with Chlorites

Société Rhodiocéta

BP 764,649

There is little or no liberation of chlorine dioxide into the atmosphere if the materials are treated with a hot chlorite solution containing an ester of an organic acid which is not oxidised under the conditions of treatment, e.g. ethyl lactate, but no other acid, acid salt or compound which yields acid on oxidation. The same bleach is obtained as would be obtained by use of acid instead of an ester. Such bleaching baths may be kept at room temperature and heated at time of use without loss in activity. Thus standing baths can be used, being brought up to strength by addition of the chlorite and ester used for each batch of material bleached.

C.O.C.

Sensitivity of Vat Dyes to Sunlight in Presence of Soap (VIII p. 231)

## VIII—DYEING

### Properties of Dyes in Solution

A. Schaeffer

*Textil.-Rund.*, **12**, 59–77 (Feb. 1957)

Dye-solubilising groups and some cases of relations between constitution and solubility, alkali sensitivity, and other properties are considered. The relation between constitution and tendency to dissociate in water is not yet clear in most cases. The type of dissociation exhibited by zwitterion-forming dyes depends on pH. Colloidal condition and micellar size depend on purity and concentration of dye, age of solution, temperature, and other factors. Completely dissociated and non-ionic micelles both exist, as well as ionised micelles occurring with unionised dye. An examination of some direct dyes showed that zwitterion-forming dyes have a particular tendency to micelle formation. This is attributed to mutual attraction of two dye molecules through acid and basic groups and subsequent increase in the tiny micelle through intermolecular forces.

S.R.C.

### Continuous Dyeing with Direct Dyes

A. Schmitz

*Canadian Textile J.*, **74**, 50–55 (25 Jan. 1957)

Translation of paper in *Z. ges. Textilind.*, **57**, 1131–1134 (5 Sept. 1955)—cf. J.S.D.C., **72**, 36 (Jan. 1956).

### Dyeing Behaviour towards Direct Dyes of Viscose Rayon modified by Oxidation

C. Daneyrolle

*Bull. Inst. Text. France*, (64), 29–44 (Dec. 1956)

A study of dyeing equilibria and kinetics for a series of direct dyes (derived from benzidine) on viscose rayon and acidic oxycellulose derived from viscose rayon shows that the nearest approach to equal depth of colour under the same conditions is given by dyes possessing high substantivity, i.e. those normally possessing poor levelling characteristics. The best results are obtained under equilibrium conditions.

J.C.F.

### Effect of Latex Compounds on the Dyeing of Spun Viscose Rayon Staple Carpeting with Selected Fast-to-light Direct Dyes

AATCC South Central Section

*Amer. Dyestuff Rep.*, **45**, p 965–p 971 (31 Dec. 1956)

When carpets are backed by latex, it is difficult to obtain uniform dyeing whether the latex is applied before or after dyeing. Several dyes were used in the present investigation, some containing copper, some not. In some cases latex was applied before dyeing, in some after. Tests were carried out on light fastness, washing fastness, and stability to ageing in oxygen and ageing in an air oven. The results show the effect of latex backing on various dyeings. Copper-containing dyes are sensitive to the dithiocarbamate accelerators in latex.

P.T.S.

### Fading and Tendering Activity in Anthraquinonoid Vat Dyes

J. J. Moran and H. I. Stonehill

#### I—Electronic Absorption Spectra of Dye Solutions

*J.U.S.*, 765–778 (Feb. 1957)

The absorption spectra of 39 anthraquinonoid vat dyes and related quinones have been determined in ethanol soln. (ultraviolet and visible spectra) and in chlorobenzene (visible spectra), and also the visible spectra of the corresponding *leuco* deriv. in aq. soln. The spectra obtained are interpreted in terms of the quasiclassical Lewis–Calvin model, together with the electromeric properties of substituent groups and additional fused rings. The two bands exhibited by most of the *leuco* deriv. are regarded as derived from the *x* and *y* bands of the corresponding quinones by considerable bathochromic displacement due to the ionic charges on the phenolic oxygen atoms. For most of the dyes the ethanol spectra are displaced bathochromically from the chlorobenzene spectra, indicating some dye–ethanol association. Although no single relation exists between spectra and fading–tendering activity, weak absorption bands, attributed to singlet–triplet transitions, are exhibited by most active, but by no inactive, dyes. Many of the dyes exhibit marked fluorescence, which may be related to photoactivity, and which is shown to cause deviations from Beer's and Lambert's laws.

#### II—Fluorescence, Absorption Spectra, and Stability to Light of Dyed Films

*Ibid.*, 779–788

A modification of the Beer–Lambert law is derived which allows for the effect of fluorescence, and is verified by absorption measurements on dyed cellulose films. Also, a simple method is described, involving comparison of absorption spectra obtained with dispersion before and after absorption, to detect the fluorescence of dyed cellulose acetate films, and to locate approx. the wavelength regions of fluorescent excitation and emission. This method is also used in investigations of fading and tendering (oxidative degradation) of these films, and is more sensitive than conventional spectrophotometric or visual examination. No simple correlation of fluorescence with mol. structure has been found for the dyes examined, or of either fluorescence or absorption spectra with fading and tendering activity.

#### III—Free-radical Production and Probable Reaction Mechanisms

*Ibid.*, 788–795

Most of the actively tendering, and some of the inactive, members of a group of 37 anthraquinonoid vat dyes initiate the polymerisation of methyl methacrylate, by free-radical production, when their oxygen-free soln. in ethanol or aq. *leuco* soln. are exposed to visible light. On the probable assumption that dye semiquinone radicals are initially produced, mechanisms are proposed

for—(a) the photo-oxidation-dehalogenation of *leuco* soln. of halogenated dyes, (b) the production of acet-aldehyde, peroxy deriv. of dyes, and hydrogen peroxide in light-exposed oxygen-free ethanolic dye soln., and (c) fading and tendering of dyed cellulose films exposed to light in air. Most dyes active in (c) emit fluorescence wavelengths shorter than ca. 500 m $\mu$ , which could provide sufficient energy for detaching a hydrogen atom from a cellulose OH group before its transfer to a dye mol. The protective action of some inactive dyes in mixed dyeings with fading-tendering dyes is held to be probably due to overlap of the fluorescence band of the active dye and the absorption band of the inactive dye in the mixed crystal, in which these bands are essentially unperturbed.

H.H.H.

#### Sensitivity of Vat Dyes to Sunlight in Presence of Soap

M. P. Khera and S. P. Kapoor

*Indian Textile J.*, **66**, 687-688 (Aug. 1956)

The vat-dyed fabric used in Indian Army uniforms shows considerable fading after a few washes followed by drying in sunlight. It is shown that, in the presence of soap, the fabric fades rapidly on exposure to light, but the presence of free alkali and detergents, Lissapol N (ICI) and Surf (Lever) causes no increase in the rate of fading. The accelerated fading is attributed to breakdown of the unsaturated soap molecules under the conditions of exposure.

W.K.R.

#### Effect of Smog on Dyes and Fibres—I

AATCC Pacific Southwest Section

*Amer. Dyestuff Rep.*, **45**, p 919-p 922 (3 Dec. 1956)

The effect of smog in Los Angeles on cellulose acetate dyed with disperse dyes, viscose rayon dyed with direct and vat dyes, nylon dyed with acid, metal-complex, and disperse dyes, wool dyed with acid and metal-complex dyes, Orion dyed with basic and disperse dyes, and cotton dyed with direct, vat, and sulphur dyes was investigated. Colour fading in smog was estimated visually by experienced colour-matchers, and the results show some fading in most cases. In a future publication photo-electric estimation of colour fading in smog will be described, as will the results of strength tests before and after exposure to smog. Analyses of the components of smog are given, and an artificial smog chamber is described.

P.T.S.

#### Dyeing Resist Processes for Wool

Anon.

*Wool Science Review*, (15), 14-25 (March 1956)

#### Chemnyle Process for dyeing Filament Nylon

W. H. Hindle

*Amer. Dyestuff Rep.*, **45**, p 972-p 974 (31 Dec. 1956)

Using traditional dyeing methods, disperse dyes give uniform dyeing with nylon but poor colour fastness, and wool dyes give good colour fastness but poor coverage and uneven dyeing. The problem of dyeing nylon was tackled from three angles—(i) by removing, by means of a swelling agent, the variations of orientation within the fibre which cause uneven dyeing; (ii) by mordanting the variations, so that the mordant and not the fibre controls the dyeing process; and (iii) by changing the dyeing mechanism of dyes known to have good fastness properties on nylon. Thus if a fast, soluble dye can be made to dye nylon in the same way as a disperse dye, it should give good uniformity. The first method was not practicable commercially, the second presented technical difficulties, and therefore the third was the most promising. Acid and direct dyes precipitated from solution by excess of acid or by the addition of electrolytes were not suitable, because dyeing was, respectively, too quick and too slow when such precipitates were redispersed. Eventually the Chemstrand Corporation found that some cationic agents, including quaternary ammonium salts, give suitable precipitates with many direct and acid dyes which give fast, uniform dyeing on nylon.

P.T.S.

#### PATENTS

#### Improving the Wet Fastness of Direct Dyeings

FBy

*BP 767,152*

Aftertreatment with a complex metal compound of a diaquamide-substituted polyalkylene imine improves the wet fastness of direct dyeings. Thus a 3% dyeing on cotton of the dye 1-hydroxybenzene-2-carboxylic acid  $\leftarrow$  4:4'-diaminodiphenyl  $\rightarrow$  1:3-dihydroxybenzene  $\leftarrow$  I-

amino-2-hydroxybenzene-3-carboxylic acid-5-sulphuric acid is treated for 30 min. at 70°C. with 0.2-3.0% of a weakly ammoniacal aqueous solution of the product obtained by boiling 30 g. polyethylene imine, 80 ml. water, 60 ml. conc. HCl and 40 g. dicyandiamide under reflux for 5 hr., treating the solution while hot with 125 g. CuSO<sub>4</sub>·5H<sub>2</sub>O and evaporating *in vacuo*. C.O.C.

#### Reducing Vat Dyes with Thiourea Dioxide

Hardman &amp; Holden

*BP 765,335*

Reducing of vat dyes with thiourea dioxide is very much more rapid if done in presence of a cationic surface active agent, e.g. cetyl trimethyl ammonium bromide. The resulting acid *leuco* vat dyes are very suitable for dyeing cellulose acetate and other non-cellulosic fibres, e.g. wool or nylon. Thus a royal blue of excellent fastness is obtained on cellulose acetate using Caledon Dark Blue GS paste (C.I. Vat Blue 16) (10% on wt. of fibres), Lissolamine A (6 g./l.), sodium phosphate (5), thiourea dioxide (2), ethylene glycol diacetate (3) for 1 hr. at 75°C. with a liquor ratio of 1 : 30 followed by oxidation and soaping. C.O.C.

#### Dyeing or Printing Fibrous Thermoplastic Synthetic Resins

Raduner &amp; Co.

*BP 764,954*

The material is dyed or printed simultaneously with improvement in its wearing properties by applying a solution yielding cellulose, a protein or poly(vinyl alcohol) on precipitation. The cellulose or protein is then precipitated or in the case of poly(vinyl alcohol) rendered water-insoluble *in situ* and the material then either dyed or printed. Thus a spun nylon fabric is padded with a solution of sodium xanthate, treated with acid, desulphurised, and dried at 140°C. for 7 min. It dyes deep red with C.I. Direct Red 79 whereas an untreated pattern dyes only pale pink.

C.O.C.

#### Level Dyeing of Synthetic Polyamide Fibres

S

*BP 765,080*

Level dyeings on nylon etc. even if the fibres have been non-uniformly stretched, are obtained by using a water-soluble mono- or diazo dye containing at least one metalisable group, e.g. the dyes described in *BP 723,632* (J.S.D.C., **71**, 261 (1955)), a copper salt, a salt of an organic acid capable of metal complex formation, e.g. tartaric, citric, lactic, salicylic or sulphonosalicylic acid and, in some cases, a non-caustic alkali.

C.O.C.

#### Vanadium, Molybdenum and Tungsten Salts as Assistants in the Cuprous Ion Dyeing Method

DuP

*USP 2,729,533*

Water-soluble salts of vanadium, molybdenum and tungsten added to cuprous ion dyebaths greatly increase the depth of dyeings made in such baths. Thus in a bath made up of 10% fructose, 3% CuSO<sub>4</sub>·5H<sub>2</sub>O and 2% C.I. Acid Red 88 polyacrylonitrile staple fibre is stained light pink but if 0.25% sodium tungstate is present then it is dyed bright red.

C.O.C.

Some Notes on the Dyeing and Tanning of Leather and on Paints and Inks in an Eleventh-century Arabic Work on Bookbinding (XII p. 235)

#### IX—PRINTING

##### Roller Printing on Wool

AATCC Rhode Island Section

*Amer. Dyestuff Rep.*, **45**, p 913-p 918 (3 Dec. 1956)

The object was to find a practical method. The effect of certain pretreatments and aftertreatments on the colour fastness and dimensional stability was investigated. Caro's acid effectively shrink-proofs wool and increases the tintorial value of dyes. The wet fastness of acid and basic dyes is improved by an aftertreatment with a silicone water-repellant. Direct dyes and neutral and acid metal-complex dyes give poor colour fastness. Vat dyes printed by the neutral reduction process show better fastness, but the fixation is only fair under conditions that minimise alkali degradation of wool. Azoic dyes and soluble vat dyes are bright, fast, and easily applied. Reactive dyes are also very suitable for printing on wool. A steaming time of 10-12 min. is sufficient to fix all the above dyes. Prints with pigments were also satisfactory. Discharge printing is not adaptable to wool fabrics. Thus, printing

on wool can be achieved using conventional cotton equipment, and this opens up a new field for wool fabrics.

P.T.S.

PATENTS

**Crimped or Cockled Cellulose Textile Fabrics**  
Sayles Finishing Plants *BP 764,377*

When applying a shrinking agent in patterns to fabric temporary application of an external mechanical deforming force, e.g. momentary crimping or creasing before excessive shrinkage occurs, causes the cockles and puckers which subsequently develop in the untreated area, to occur in accordance with the previously applied mechanical deformation.

C.O.C.

**Screenprinting with Thermofluid Inks**  
L. Dubuit *BP 768,623*

The screen is maintained at 60–80°C, and the sheet to be printed is brought to the same temperature immediately before and/or during printing. The ink used is a mixture of one or more resins and a pigment which melts at a temperature between that of the atmosphere and the screen. Thus when the ink is placed on the screen it melts and is forced through it by the squeegee immediately the screen is removed from the material being printed the print dries instantaneously. The prints are very fine, brilliant, perfectly glazed and do not have jagged edges.

C.O.C.

**Mechanism of Dye Formation in Colour Photography**  
(IV p. 220)

**Dyeing or Printing Fibrous Thermoplastic Synthetic Resins** (VIII p. 231)

**Ornamental Effects on Polyester Fabrics** (X p. 233)

## X—SIZING AND FINISHING

**Soluble Chemically Modified Cotton Fibres**

R. M. Reinhardt and J. D. Reid

*Text. Research J.*, 27, 59–66 (Jan. 1957)

A review with 34 references.

J.C.F.

**Cellulose-Alkali Hydroxide-Water System in the Cyanoethylation of Cotton Cellulose**

E. Klein, J. W. Weaver, B. G. Webre, and J. F. Jurgens

*Text. Research J.*, 27, 50–53 (Jan. 1957)

Previous work on the effect of the ratios base : cellulose : water on the rate of the reaction of cotton with a large excess of acrylonitrile (*ibid.*, 26, 518 (1956)) was limited to the base NaOH. Similar work is now reported for LiOH, KOH, and CsOH. The variations in yield and reaction rate can be explained by considering the effect of the amount, concentration, and nature of the alkali-metal hydroxide, which impregnates the cellulose, on the cellulose ion concentration, solubility of acrylonitrile, and bond strengths. The microbiological resistance of the product also is determined by the ratios base : cellulose : water. The rate of reaction and the yield of cyanoethylated cotton can be greatly improved by the inclusion of hydroscopic salts in the padding liquor.

J.C.F.

**Influence of Micronaire Fineness and Prior Treatments on the Cyanoethylation of Cotton**

R. M. Reinhardt and J. D. Tallant

*Text. Research J.*, 27, 24–29 (Jan. 1957)

The highly significant rank correlation observed between Micronaire fineness and N content for various times of treatment in the cyanoethylation process suggests that the Micronaire value may serve as a suitable index of the time required to attain a given N content. The effect of prior treatments (pressure boiling, ethanolamine extraction, and mercerisation) on the rot resistance of a cyanoethylated cotton of ca. 4% N content was studied. For mercerised cotton, higher degrees of substitution appear to be necessary to impart rot resistance by cyanoethylation.

J.C.F.

**Microscopical Observations on Partially Acetylated Cottons and Related Fibres**

V. W. Tripp, R. Giuffria, and I. V. de Gruy

*Text. Research J.*, 27, 14–24 (Jan. 1957)

Microscopical examination of partially acetylated (PA) cottons shows that cross-sectional area increases and refractive index decreases with increasing substitution. It is suggested that refractive-index measurement might

prove a feasible method for estimating the degree of substitution of PA cottons. When PA cotton fibres are embedded in polymethacrylate, swelling occurs, and the consequent separation of the lamellae of the secondary wall allows the examination of the interior elements of the fibre in thin cross-sections under the electron microscope. Fragments of PA cotton obtained by wet-beating show a progressive loss of fibrillar structure as the acetyl content increases. At high degrees of substitution the cotton fragments resemble the spongy material obtained from wet-beaten cellulose acetate.

J.C.F.

**Structure of Synthetic Resins**  
G. Zigeuner and K. Jellinek

**IV—Interaction of *p*-Nitrophenol and Hexamethylenetetramine**

*Mh. Chem.*, 87, 778–782 (Dec. 1956)

2:2'-Dihydroxy-5:5'-dinitrobenzylamine is formed, and not its N-hydroxymethyl deriv. as reported previously.

**V—Oxidative Degradation of Methyleno, Oxy-methylene, and Aminomethylene Links in Phenoplasts**

*Ibid.*, 793–794

Methylene, unsubstituted and substituted hydroxymethylene, and aminomethylene groups are oxidised to carboxy groups by alkali fusion in presence of lead dioxide. The phenolic nuclei in phenoplasts are thus converted into phenocarboxylic acids, which can be identified by paper chromatography.

H.E.N.

**Treatment of Wool with Acid Bromate Solutions**  
K. W. Statham

*Text. Research J.*, 27, 41–49 (Jan. 1957)

The reaction of acid bromate solutions with wool is shown to be activated (a) by certain reducing agents, which reduce part of the bromate to bromide, causing liberation of bromine by a bromate–bromide–acid reaction, and (b) by aldehydes, with which the intermediate formation of bromide is unlikely. For treatment of wool to impart shrink-resistance, the formaldehyde-activated reaction appears to be the more suitable. The treated wool is of a good colour and possesses a very low residual oxidising power. The alkali-solubility is not much increased, possibly owing to the cross-linking action of formaldehyde.

J.C.F.

**Modified Acid Colloid Process for Controlling Wool Fabric Shrinkage**

R. F. Nickerson

*Text. Research J.*, 27, 54–58 (Jan. 1957)

A simple process for shrinkproofing wool fabrics is described. The fabric is impregnated with a melamine resin acid colloid and dried at 200°F. or below. A higher resin content is necessary at low curing temperatures than at high temperatures to achieve the same reduction in shrinkage. The low-temperature curing process should be useful for heavy fabrics, such as blankets, on account of their thermal insulating properties.

J.C.F.

**Antistatic Agents as applied to Wool**

J. A. Medley

*J. Textile Inst.*, 48, p 112–p 122 (Jan. 1957)

Wool is not inherently immune to the accumulation of static charges, but it absorbs conducting electrolytes in scouring, for example, and there is usually a rapid discharge of any static electricity at R.H. above 55–60%. Pure oils on wool have no antistatic effect, but they usually contain conducting contaminants, and the rough scaled surface of wool allows the use of more oil than on other fibres. Rollers rather than interfibre friction seem to be responsible for the generation of static electrification, and if the fibres or their surface dressing are good enough conductors, the charge is conducted back to the rollers. The conductivity of oils varies, in general, with their viscosities. The moisture content of an oil affects its conductivity. Wool is a strongly positive fibre, and so non-ionic or anionic dressings are not completely satisfactory antistatic agents. Quaternary ammonium compounds, polyethylene oxide condensates, triethanolamine oleate, or polyethylene oxides with secondary or tertiary amines have all been used in wool-combing oil. Examples are given from wool carding and worsted spinning.

P.T.S.

**Cyanoethylation of Wool**

N. M. Bikales, J. J. Black, and L. Rapoport  
*Text. Research J.*, 27, 80-81 (Jan. 1957)

Up to 5% by weight of cyanoethyl groups can be introduced by treating wool with a large excess of acrylonitrile in presence of a small amount of aqueous alkali. The conditions are such that the physical properties of the fibre are substantially unchanged. Preliminary investigations suggest that the treated fibre possesses an increased affinity for certain types of dyes. J.C.F.

**PATENTS****Fugitive Tinting**

British Rayon Research Assocn. **BP 767,289**

An aqueous dispersion of a pigment prepared from a direct dye is used. The pigment should be insoluble in water but soluble in alkaline liquors so that it will be cleaned by mild scouring with an alkaline liquor. Suitable dispersions are preferred by adding to a 0.1% aq. soln. of C.I. Direct Red 82 or 107, C.I. Direct Violet 53 or C.I. Direct Blue 76 containing 0.8% of casein, enough  $\text{Ca}^{2+}$  solution to give 1 part of Ca per 2000-3000 parts of the dispersion. C.O.C.

**Etherification of Fibrous Cellulose with Chloroacetic Acid**

L. Balassa and H. A. Christoph **USP 2,729,535**

The fibres are impregnated with ammonium chloroacetate, dried and then treated with 40-55% NaOH at 55-85°C., e.g. one glycolic acid group was substituted to each 15-25 glucose units when cotton impregnated with 5-10% of ammonium chloroacetate was treated for 45-65 sec. in the hot caustic liquor. C.O.C.

**Fixing Mechanical Effects on Fabrics containing Thermoplastic Material**

Bradford Dyers' Assocn. **BP 764,088**

The mechanical finish is applied while the fabric is saturated or almost saturated with water. Thus unset nylon fabric is impregnated with 45% of its dry weight of water and is then passed through an embossing calender having an engraved steel roller at 177°C. and a wooden paper bowl, both bowls being 8 in. wide and the pressure on them 3810 lb. Comparison of the finished fabric with a fabric similarly embossed while dry shows that on soaping at 60°C. for 30 min. the wet embossed fabric retains the embossing better and also does not shrink so much in area as the dry embossed fabric. C.O.C.

**Modifying the Properties of Products produced from Organic Filmforming Substances**

Bradford Dyers' Assocn. and Albright & Wilson **BP 764,312**

Organic film-forming substances, e.g. cellulose derivatives, resins, gelatin and the like, are mixed with a tetrahydroxymethyl phosphonium salt or trihydroxymethyl phosphine oxide. This reduces the inflammability and/or water-solubility of products formed from the mixture and also increases their resistance to microbiological attack. C.O.C.

**Improving the Abrasion Resistance of Resin-treated Fabric**

Linen Industry Research Assocn. **BP 766,265**

Fabric, particularly linen fabric, which has been treated with a urea- and/or melamine-formaldehyde resin is subsequently and separately treated with < 5% of a thermoplastic synthetic resin, e.g. with an aqueous dispersion of a copolymer of ethyl acrylate and vinyl acetate followed by drying at 80-90°C. C.O.C.

**Ornamental Effects on Polyester Fabrics**

Bleachers' Association **BP 765,096**

A swelling agent is printed on the fabric, which is then heated to cause the printed areas to shrink. C.O.C.

**Water-repellent Finish**

Boehme Fettchemie **BP 765,208**

All kinds of textile materials are rendered water-repellent by treating them in an aqueous solution containing 1-20 g./l. of a compound of formula—



( $\text{R}^1$  and  $\text{R}^2$  = same or different, high molecular Alk. cycloalkyl, alkylcycloalkyl or alkylaryl, while  $\text{R}^1$  or  $\text{R}^2$

may = H), e.g. monocetyl phosphate, squeezed, and dried at > 90°C. C.O.C.

**Flame-resistant Fabrics, Paper, etc.**

L. J. C. V. de Zande **BP 765,237**

The material is treated with an aqueous solution of ammonium sulphate, ammonium phosphate, boric acid, sodium tetraborate and 1-5% by wt. each of glycerine and Turkey red oil. C.O.C.

**Improving the Fire-resistant and other Properties of Textiles**

Courtaulds **BP 765,222**

The materials are impregnated with an aqueous solution containing a vinyl ester of a phosphorus-containing acid and then heated to cause the ester to react with the fibres. The process is applicable to all types of inflammable fibres. In addition to improved fire-resistance the materials are also given improved dimensional stability and abrasion resistance. Rayon staple so treated has improved bulking power. Thus spun viscose fabric was padded with divinyl phosphorimidate (20 parts),  $\text{Na}_2\text{CO}_3$  (1) and water (80), dried and baked for 4 min. at 140°C. The finished fabric was flame- and glow-proof, even after soaping for 20 min. at 80°C. and was insoluble in cuprammonium C.O.C.

**Improving the Antistatic and Elastic Properties of Textiles**

Lanolized **BP 767,771**

Textiles of all types of fibres are treated with an aqueous emulsion of lanolin containing in the aqueous phase both a cationic and a nonionic emulsifying agent and the lanolin being deposited on the fibres by adding an alkali or an anionic emulsifying agent. Thus nylon hosiery after being dyed and rinsed is treated with alkali-neutralised sulphurated castor oil so that it takes up about 0.25% of its wt. of the oil and 50% of its wt. of water. It is then treated for 15 min. at 90-100°F., pH 8 and liquor ratio 20:1 in an aqueous emulsion containing lanolin (8% on wt. of goods) distearyltrimethylammonium chloride (15% on wt. of lanolin) and poly(monoolein of stearic acid) (5% on wt. of lanolin), the bath (which is exhausted) run off and the hosiery dried and boarded. The resulting finish resists 8 washings. C.O.C.

**Ruffle Finish**

Bleachers' Assocn. and Bradford Dyers' Assocn. **BP 763,933**

Selected areas of the fabric are stretched while adjacent areas are allowed to remain unstretched. This may be effected by running the compressive shrinking apparatus described in *BP 752,191* (J.B.D.C., 72, 507 (1956)) in reverse, i.e. the fabric while contracted is fed so that selected areas press against the surface of a deformable flexible material and, while so held, the surface is caused to expand so that lengthening of the held areas results. C.O.C.

**Embossed Pile Fabrics**

Mohaseo Industries **BP 768,328**

A pile fabric containing heat-shrinkable fibres in the pile is locally heat-treated so as to cause the pile to shrink in the treated areas. C.O.C.

**Reflective Fabrics**

Minnesota Mining & Manufacturing Co. **BP 767,009**

A reflective fabric which can be drycleaned and exposed to intense infrared radiation without detriment to its reflecting properties comprises a fabric base to which is bonded an extremely thin, opaque, visibly continuous, highly reflective metal surface. The metal coating is formed on a smooth, flexible carrier and then covered with a layer of a heat-curable, thermoplastic, oil-resistant rubbery polymer and a tackifying resin. This assembly is then applied, adhesive layer first to the fabric, the adhesive cured to render it solvent- and heat-resistant, after which the carrier is stripped from the metal film. C.O.C.

**Metallised Laminated Sheet Materials**

DuP **BP 766,853**

A flexible substrate of or coated with a vinyl chloride polymer is coated with an adhesive layer made up of 80-90% vinylchloride, 19.7-7.9% vinylacetate and 0.3-3.0% of an  $\alpha\beta$ -olefinic unsaturated dicarboxylic acid and a polyalkylacrylate or methacrylate (Alk of 1-8 C). The metallised surface of a film of polymeric linear terephthalate is then applied to the adhesive layer and the

whole pressed together. The product has a highly lustrous metallic finish of good resistance to abrasion. C.O.C.

**Wash-fast Pleating of Fabrics**  
United Merchants & Manufacturers

BP 764,353

Cotton, cellulosic or linen fabric is impregnated with a thermosetting ethyleneurea-formaldehyde resin, at least partly dried, pleated, baked, and washed. C.O.C.

**Non-woven Fabric**

Chicago Manufacturing Corp. BP 764,086

A fully or partly oriented lap of fibres bonded together by an adhesive applied in a regular pattern so as to angularly displace the fibres with respect to the areas to which adhesive is applied, has the adhesive set, is then stretched transversely to the direction of orientation of the fibres and while stretched is finally rebonded. The resulting fabric has the same strength crossways and lengthways. C.O.C.

Some Applications of Organic Diisocyanates and their Derivatives in the Textile Industry (III p. 216)

Crimped or Cockled Cellulose Textile Fabrics (IX p. 232)

Biological Degradation of Cellulose Derivatives (XI this page)

**XI—PAPER AND OTHER CELLULOSIC PRODUCTS**

**Moisture Relations of Cellulose. III—Sorption Hysteresis and the Effect of Temperature**

M. Wahba and S. Nashed

*J. Textile Inst.*, 48, T 1-T 20 (Jan. 1957)

Adsorption-desorption cycles of water vapour on soda-boiled cotton from dryness to saturation were determined at 20°, 30°, and 40°C. The cotton was stabilised by alternately drying and saturating with water vapour seven times. The heats of sorption of water on the cellulose were calculated by applying the Clausius-Clapeyron equation to the results of the adsorption-desorption experiments, and the values obtained were found to be incompatible with calorimetric values for the heats of sorption. The Clausius-Clapeyron equation is based on three assumptions: (i) that the sorption isotherms represent equilibrium conditions—it has been demonstrated many times that sorption hysteresis occurs even when it is certain that equilibrium conditions have been attained; (ii) that the heat of adsorption is independent of temperature over the range where the equation is applied—in the present experiments slight differences in the heat adsorption would not account for the anomalous results; and (iii) the sorbing surface should be identical at the two chosen temperatures for any given moisture content. The authors suggest that the discrepancy between the heats of sorption by the two methods can be explained if assumption (iii) is not justified.

There are three possible explanations of sorption hysteresis: (i) capillary condensation and retention of water within the cellulose—the authors think that this may be partly responsible for the observed hysteresis; (ii) the formation of a multilayer of adsorbate; and (iii) an increase in the sorbing surface during adsorption which is partly retained during desorption. The authors favour the third explanation and go on to give a detailed example of Hermans' theory of hysteresis (*Physics and Chemistry of Cellulose Fibres*, 1949). Water molecules form one, two, or three hydrogen bonds with the cellulose molecules, and with some external energy can be made to break inter-chain linkages between cellulose chains. The interchain forces are thus reduced, permitting more water molecules to be adsorbed; i.e. the third assumption on which the use here of the Clausius-Clapeyron equation is based is not valid.

Variations in the degree of hysteresis at different temperatures are thought to be a result of two competing effects of temperature. Rise in temperature would tend to decrease the amount of adsorption, and at the same time to weaken the interchain bonds, giving rise to new adsorbing surfaces. The onset of this latter effect seems to occur between 30° and 40°C. P.T.S.

**Main Direction of Reaction in the Thermal Decomposition of Cellulose in Vacuo**

V. I. Ivanov, O. P. Golova, and A. M. Pakhomov

*Izvestiya Akad. Nauk S.S.R., Otdel. khim. nauk*, 1266-1267 (Oct. 1956)

Thermal-decomposition experiments on celluloses of differing hydrolysability in absence and presence of water and of glucose (which has been suggested as an intermediate product in the formation of laevoglucosan by the decomposition of cellulose—its presence is in fact found to reduce the yield of laevoglucosan) indicate that hydrolysis, oxidation, anddehydation processes play only secondary parts in the decomposition process. By suitable adjustment of conditions it is found possible to obtain yields of more than 60% of laevoglucosan in the thermal decomposition of cellulose *in vacuo*, and it is considered that the main reaction is scission at the 1:4-glucoside links with formation of fragments that isomeric into laevoglucosan. A.E.S.

**Chemical Changes produced in the Cellulose Macromolecule by Oxidising Agents. XI—Causes of the Chemical Instability of Celluloses oxidised with Nitrogen Dioxide**

E. D. Kaverznova and S. A. Kist'

*Izvestiya Akad. Nauk S.S.R., Otdel. khim. nauk*, 604-614 (May 1956)

The instability of cellulose oxidised with  $\text{NO}_2$  to alkaline hydrolysis is to be attributed largely to its high content of keto groups (the aldehyde content is very low; see J.S.D.C., 72, 484 (1956)), for data in the literature indicate that  $\text{COOH}$  groups are without appreciable effect (work on pectic and alginic acids indicates that 6-COOH has little effect, and other work shows that 2- and 3-COOH (ruptured pyran ring) are also without great effect). The instability of these oxycelluloses to keeping in presence of air and moisture is also to be attributed to the presence of keto groups and is largely removed when these groups are blocked by reaction with hydroxylamine. Evidence is cited which indicates that the acid hydrolysis of these oxycelluloses is not greatly accelerated by the presence of residues containing only carboxyl or only keto groups; the main accelerating factor is considered to be the disturbance of the pattern of molecular interaction by the introduction of new groups, purely chemical effects—due to opened pyran rings and residues containing both carboxyl and keto groups—being of secondary importance. A.E.S.

**Kinetics of the Xanthate Reaction of Cellulose. I—Xanthation of Monomeric Sugars and Dissolved Hemicelluloses**

B. Philipp

*Faserforsch. und Textiltech.*, 8, 21-27 (Jan. 1957)

Kinetics of the xanthation of hemicelluloses in 5 N. and 1.5 N- $\text{NaOH}$  are compared with those for xanthation of some monomeric sugars. W.R.M.

**Formation of Trithiocarbonates in the Xanthate Reaction**

M. Wronski

*Faserforsch. und Textiltech.*, 8, 32-34 (Jan. 1957)

A photometric method of estimating trithiocarbonate in viscose is described and the kinetics of trithiocarbonate formation discussed. Reactions leading to the formation of trithiocarbonates are suggested. W.R.M.

**Biological Degradation of Cellulose Derivatives**

E. T. Reese

*Ind. Eng. Chem.*, 49, 89-93 (Jan. 1957)

For soluble cellulose derivatives, it is considered that at least one substituent on every anhydroglucoside unit is required to confer resistance to biological attack, but an average degree of substitution of one is not necessarily adequate, because there may be chains of unsubstituted units owing to poor distribution of the substituents. The nature of the substituent and its location are also of importance, and modification of anhydroglucoside units during preparation may also affect the susceptibility to attack. W.K.R.

**Far Hydrolysed Cellulose Acetates—Preparation, Properties, and Uses**

C. J. Malm, K. T. Barkey, M. Salo, and D. C. May

*Ind. Eng. Chem.*, 49, 79-83 (Jan. 1957)

Cellulose acetates of low acetyl content are prepared by hydrolysing esters of higher acetyl content in acetic

acid-water solution, with sulphuric acid as catalyst, at 40–60°C. The acetyl content and the water susceptibility of the products are easily controlled. In the range 13–19% acetyl the products are soluble in water, whilst with 19–24% acetyl they are insoluble in acetone and water, but soluble in 2-methoxyethanol-water (1:1). The properties of typical acetates of 17% and 24% acetyl content are described. Potential uses are suggested for these water-soluble and nearly water-soluble esters, including abrasion-resistant film coatings, and as yarn sizes. W.K.R.

#### Preparation of Phthalic Esters of Cellulose

C. J. Malm, J. W. Mench, B. Fulkerson, and D. G. Hiatt  
*Ind. Eng. Chem.*, **49**, 84–88 (Jan. 1957)

Phthalic derivatives of ethylcellulose and cellulose acetate may be prepared, without the aid of pyridine, by using acetic acid as solvent and sodium acetate as catalyst. A study of the reaction conditions is reported. The phthaloyl content of the derivatives is inversely proportional to the reaction temperature, though the rate of introduction is faster at higher temperatures, and is also influenced by the proportions of acetic acid, sodium acetate, and phthalic anhydride in the reaction mixture. Correct balance of acetyl or ethoxyl, phthaloyl, and hydroxyl groups gives derivatives which dissolve in aqueous alkalis. W.K.R.

#### Temperature-Viscosity Relationships for Water-soluble Cellulose Ethers

A. B. Savage

*Ind. Eng. Chem.*, **49**, 99–103 (Jan. 1957)

The relationship between viscosity and temperature (25–90°C.) is reported for solutions of methylcelluloses (degree of substitution, D.S. 1.2–1.9) and sodium carboxymethylcellulose (D.S. 0.55–1.23). Data are also provided on the effects of various treatments, particularly enzymolysis, on this relationship. W.K.R.

#### Investigations on Carboxymethylcellulose. II—Rheological Measurements and their Molecular Interpretation

J. Schurz and H. Streitzig

*Mh. Chem.*, **87**, 632–645 (Oct. 1956)

#### Rheology of Sodium Carboxymethylcellulose Solutions

E. H. deButts, J. A. Hudy, and J. H. Elliott

*Ind. Eng. Chem.*, **49**, 94–98 (Jan. 1957)

To explain the rheological behaviour of sodium carboxymethylcellulose (C.M.C.) solutions, it is suggested that poorly soluble crystalline material derived from the original cellulose acts as a gel centre which entraps a relatively large amount of soluble C.M.C. in a network held together by electrostatic and van der Waals forces. Aggregation and dispersion of these gel centres account for the thixotropic properties of C.M.C. solutions. W.K.R.

#### Molecular Weight Determination of Ligninsulphonic Acid

K. Bárány, F. Guba, and G. Tamásovits

*Faserforsch. und Textiltech.*, **8**, 27–29 (Jan. 1957)

Molecular weights are determined by means of diffusion, density, and viscosity measurements. W.R.M.

#### PATENTS

#### Improving the Colour of Unsized Porous Paper

American Cyanamid Co.

U.S.P. 2,730,446

Incorporation of 0.12–10% of a cationic urea- or melamine-formaldehyde resin to the pulp suspension not only eliminates all necessity for sizing agents but enables the paper to be coloured satisfactorily with acid dyes and insoluble pigments as it increases their colour value by many times and decreases their tendency to bleed. C.O.C.

#### Pigment-containing Paper-coating Compositions

National Cash Register Co.

BP 760,080

Highly adsorbent pigments, such as attapulgite, zeolite materials, or clay, are added in dry, particulate form to an aqueous dispersion of sodium pyrophosphate, sodium silicate, casein solution, and latex in order to maintain the pigment particles in clumps for better adsorption and absorption of oily printing inks and to reduce the amount of water required for the coating composition. K.W.

New Method for preparing Cellulose Thiourethans (VI p. 228)

Metallised Laminated Sheet Materials (X p. 233)

## XII—LEATHER; FURS; OTHER PROTEIN MATERIALS

#### Some Notes on the Dyeing and Tanning of Leather and on Paints and Inks in an Eleventh-century Arabic Work on Bookbinding

M. Levey, M. Krek, and H. Haddad

*Iris*, **47**, 239–243 (1956)

*Chem. Abstr.*, **51**, 782 (25 Jan. 1957)

The *Staff of the Scribes and Implements of the Discerning* by Al-Mu'izz ibn Badis gives accounts of leather tanning and dyeing, glues, paints, and inks. C.O.C.

## XIII—RUBBER; RESINS; PLASTICS

#### High-Intensity Flash Irradiation of Polymers

J. L. Lundberg and L. S. Nelson

*Nature*, **179**, 367–368 (16 Feb. 1957)

High-intensity flash irradiation of a number of polymers, including poly(ethylene terephthalate), 6,10-nylon, cellulose, and cellulose acetate, caused violent heterogeneous decompositions within the polymers. More detailed studies with polythene showed that the decompositions are produced by radiation from about 3000 Å. to the near infrared and depend on the total energy per flash. Mass-spectrometer analyses of gases liberated showed the presence of  $H_2$ , water,  $CO$ ,  $CO_2$ , methane, and hydrocarbons. Wax-like materials also were formed. Decomposition also seems to depend on the presence of impurities such as carbon black, graphite, ferric oxide, and iron. It is suggested that decompositions are initiated by nearly adiabatic black-body radiation of minute solid particles in the polymer. W.R.M.

#### Dye-sensitised Photopolymerisation of Acrylamide

G. K. Oster, G. Oster, and G. Prati

*J. Amer. Chem. Soc.*, **79**, 595–598 (5 Feb. 1957)

Vinyl compounds can be polymerised by visible light in presence of certain dye-reducing agent combinations. Some dyes in presence of mild reducing agents undergo photoreduction to the leuco form. If this photoreduction is carried out in complete absence of oxygen no polymerisation of vinyl monomer occurs. However, addition of oxygen after photoreduction starts up polymerisation, indicating that the free radicals which initiate polymerisation arise from the reaction between the leuco dye and oxygen. Of the dyes used riboflavin is unique in that part of the dye itself, viz. the ribose group, acts as its own reducing agent. Using riboflavin and visible light, polymerisation, which is an exothermic reaction, proceeds so rapidly that the course of polymerisation can be followed by adiabatic thermal rise. Investigations into the kinetics of this reaction are described. C.O.C.

#### mm'-Divinylazobenzene and mm'-Divinylazoxybenzene

J. W. Breitenbach and H. Frittum

*Mh. Chem.*, **87**, 788–792 (Dec. 1956)

The reduction of *m*-nitrostyrene with stannous chloride in excess of sodium hydroxide yields *mm'*-divinylazoxybenzene, and not the corresponding azo epd, as thought heretofore. The epd. is used in the prepn. of cross-linked polymers. H.E.N.

#### Polymerisation of Styrene by Diazoamino Compounds and Certain Activators

P. A. Vinogradov

*J. Gen. Chem. U.S.S.R.*, **26**, 2882–2890 (Oct. 1956)

Polymerisation of styrene in the condensed phase by diazoamino benzene is promoted by the presence of organic acids and their anhydrides, and the following order of decreasing activating action is given:  $C_6H_5COOH > HCOOH > CH_3COOH > C_6H_5COOH > C_6H_5COOH >$  oleic acid. G.J.K.

#### PATENTS

#### Decorating Toy Balloons or Similar Inflatable Articles

London Rubber Co.

BP 766,673

The article is wholly or partly inflated and placed between co-axial supports where it is kept by its own resilience. While between the supports dye is applied to the article's outer surface, e.g. by spraying, during which time either the article is rotated about its axis or the device supplying the dye revolves around the article. By mounting a series of such supports on a turntable and

providing a series of spraying stations around it, processing can be made continuous and a multi-colour design applied.

C.O.C.

**Vinyl Acetate Resin Compositions**

ICI

The condensates of glycols with aliphatic carboxylic acids when modified with an aromatic carboxylic acid yield polyesters which are highly efficient plasticisers for vinyl acetate resin compositions and have the advantage of not readily migrating or volatilising from such compositions. Such plasticised compositions have a wide range of uses either alone, e.g. as moulding compositions, or in solution or aqueous dispersion, e.g. for coating textiles, leather or paper. They are of particular value as the resin component in water emulsion paints. C.O.C.

Metallised Laminated Sheet Materials (X p. 233)

**XIV—ANALYSIS; TESTING; APPARATUS**

**Recent Trends in Analysis of Industrial Effluents**

W. A. Moore and M. B. Ettinger

*Anal. Chem.*, 28, 1819–1921 (Dec. 1956)

L.T.W.

**Mass-spectrometric Determination of Volatile Solvents in Effluents**

G. P. Happ, D. W. Stewart, and H. C. Cooper

*Anal. Chem.*, 29, 68–71 (Jan. 1957)

**Detection of Surface-active Alkylarenesulphonates by Alkaline Fusion and Formation of an Azo Dye**

M. J. Rosen and G. C. Goldfinger

*Anal. Chem.*, 28, 1979–1981 (Dec. 1956)

Surface-active alkylarenesulphonates may be detected by fusion with KOH and coupling the phenol so obtained with bisdiazotised dianisidine, a positive reaction being indicated by the production of a purple, red, or orange colour. Compounds containing nitro or halogeno substituents in the aromatic ring do not so react.

L.T.W.

**Potentiometric Titration of Hydroperoxides and Per-acids in Anhydrous Ethylenediamine**

A. J. Martin

*Anal. Chem.*, 29, 79–81 (Jan. 1957)

Per-acids, primary and secondary alkyl hydroperoxides, and hydrogen peroxide may be titrated potentiometrically as weak acids with sodium ethoxide in anhydrous ethylenediamine. The results obtained are accurate to within 2%.

L.T.W.

**Paper Chromatography of Organic Substances. I—Nitro and Halogeno Compounds, Aldehydes, and Ketones**

V. Prey and A. Kabil

*Mh. Chem.*, 87, 625–631 (Oct. 1956)

**Determination of Diazonium Compounds with Chromous Chloride**

R. S. Bottei and N. H. Furman

*Anal. Chem.*, 29, 119–120 (Jan. 1957)

The diazonium compound is reduced to the corresponding hydrazine compound by treatment in 0.05 N-HCl soln. with an excess of standard chromous chloride soln., the excess of which is back-titrated potentiometrically with ferric alum.

L.T.W.

**Colorimetric Estimation of  $\alpha$ -Naphthol with Sodium Cupribromide**

S. Saam, J. J. Kaufman, and J. Kiernan

*Anal. Chem.*, 29, 143–144 (Jan. 1957)

$\alpha$ -Naphthol reacts quantitatively with sodium cupribromide to give a blue colour;  $\beta$ -naphthol and other phenols do not interfere.

L.T.W.

**Estimation of Arylamides of 3-Hydroxy-2-naphthoic Acid and Related Compounds**

E. H. Daruwala and N. F. Desai

*Anal. Chem.*, 29, 116–118 (Jan. 1957)

An alkaline soln. of an arylamide of 3-hydroxy-2-naphthoic acid is titrated with standard HCl in aq. medium using phenolphthalein as indicator, and in methanolic medium using Alkali Blue 2B (C.I. Acid Blue 119) as indicator. The amount of alkali combining with the arylamide is calculated from the difference in the titres.

L.T.W.

**Paper Chromatography of Anthraquinone Pigments**

—II

M. Takido

*Pharm. Bull. (Japan)*, 4, 45–48 (1956);  
*Chem. Abs.*, 51, 953 (25 Jan. 1957)

The pigments were separated at 16–20°C. by one-dimensional ascending paper chromatography using as solvent systems—(a) petroleum ether saturated with 97% methyl alcohol; (b) the upper layer of a mixture of petroleum ether, acetone, and water (1 : 1 : 3); (c) the lower layer of a mixture of acetone, benzene, and water (1 : 5 : 2 : 1); (d) petroleum ether saturated with water; and (e) butyl alcohol saturated with 28% NH<sub>4</sub>OH. The coloration of spots was observed after spraying with Mg acetate dissolved in methyl alcohol for solvents (a)–(d), whereas for solvent (e) the original colour of the spots was used. The resulting *R*<sub>f</sub> values and colorations of the spots are tabulated for 70 different anthraquinone pigments. The relationship between *R*<sub>f</sub> values and the nature and positions of the groups substituted in the anthraquinone ring are discussed, and tentative conclusions reached as to what is the best solvent system for separating the various pigments.

C.O.C.

**Chromatographic Identification of the Anthocyanin Pigments of Fruits, Vegetables, and Flowers**

A. Fouassier

*Rev. Fermentations et Inds. aliment.*, 11, 174–192 (1956)

**Electrical Instruments for Measuring Moisture Contents of Textiles**

AATCC New York Section

*Amer. Dyestuff Rep.*, 45, p. 935–p. 945 (17 Dec. 1956)

A critical examination of the accuracy of electrical moisture-measuring instruments with textiles treated in various ways. There are two main types of instrument: the D.C., resistance-measuring instrument, for which there is a straight-line log-log relationship between moisture content of a fabric and its resistance, and which is unaffected by small changes in thickness and composition of the sample; and the A.C., dielectric-constant measuring instrument. Yarns and fabrics were treated with dyes, resins, salts, and oils, and it was found that for wool the meter readings at approx. 10% regain remained within 1–2% of the values found by oven drying. The effects of dung and burrs, of mineral and organic acids, and of varying amounts of dye were also examined. With cotton and viscose rayon, however, such treatments lead to erroneous moisture-meter readings, and the instruments have to be calibrated for each type of fabric, each finish, and each dye. Data from 22 industrial questionnaires are examined, and with the above reservations, all instruments are sufficiently accurate for the uses for which they are intended.

P.T.S.

**Determination of the Crystallinity of Cotton Fibre by the Iodine-absorption Method**

K. S. Bhujang and C. Nanjundayya

*Text. Research J.*, 27, 79–80 (Jan. 1957)

Crystallinity values of 15 cottons belonging to 4 different species were determined by the iodine-absorption method. The range of the results was 3% for raw cotton samples and 1.3% for dewaxed samples. No relationship was apparent between the crystallinity value and the physical characteristics of the fibre.

J.C.F.

**Complexons—A Bibliography of Analytical, Biological, and Industrial Applications (III p. 216)**

**Applications of Infrared Spectroscopy to Textile Problems (VI p. 227)**

Acetone from Simple Sugars (VI p. 228)

**XV—MISCELLANEOUS**

PATENT

**Colouring Concrete for Camouflage Purposes**

H. Ganoloser

BP 767,875

Inorganic pigments, particularly metal oxides, hydroxides, or oxyhydrates, added to concrete in amounts of < 20% much increase both the strength and wear resistance of the concrete. They also impart to the concrete the desired amount of reflection for infrared photography thus making the camouflage equally suitable for avoiding detection by either day or night photography.

C.O.C.

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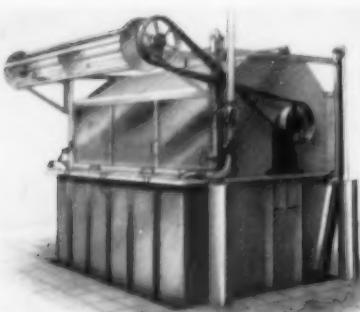
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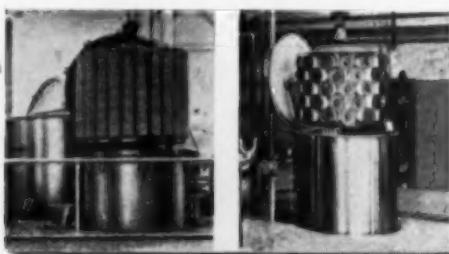
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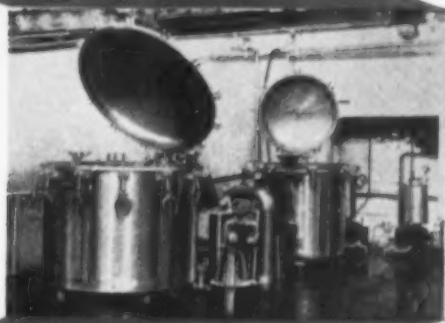
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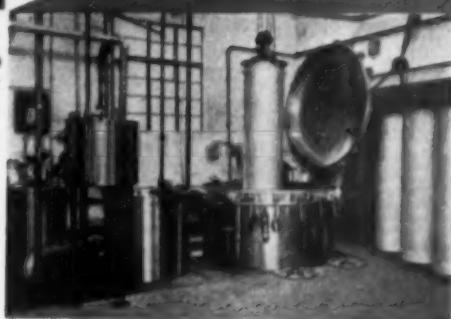
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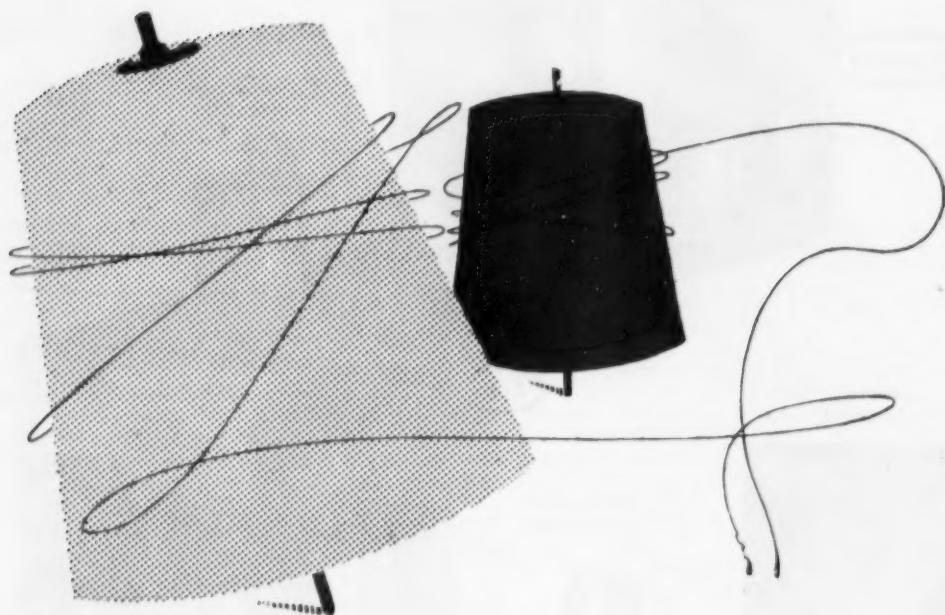
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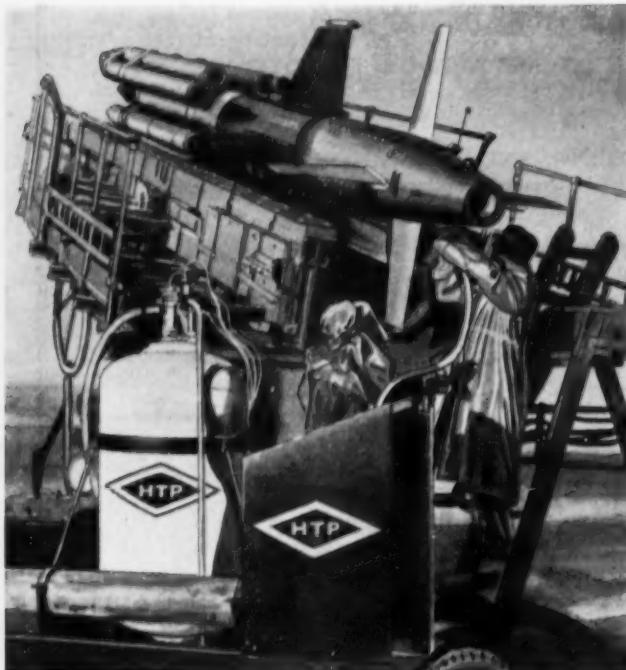
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